866

5400 SERIES

DIGITAL VOLTMETER

DANA™

Dana Laboratories Incorporated
Irvine, California 92664

Telephone (714) 833-1234
Teletype 910-595-1136

5400 SERIES

DIGITAL VOLTMETER

DANA™

Dana Laboratories Incorporated
Irvine, California 92664

Telephone (714) 833-1234
Teletype 910-595-1136

JANUARY, 1968
REVISED APRIL, 1969

PUBLICATION
980202

Table Of Contents

Section	Title	Page
1	GENERAL DESCRIPTION	1-1
1.1	INTRODUCTION	1-1
1.6	OPERATIONAL DESCRIPTION	1-1
1.12	SPECIFICATIONS	1-4
2	INSTALLATION	2-1
2.1	UNPACKING AND INSPECTION	2-1
2.7	POWER CONNECTIONS	2-1
2.9	INPUT/OUTPUT CONNECTIONS	2-1
2.12	REMOTE PROGRAMMING/ELECTRICAL OUTPUT	2-2
3	OPERATION	3-1
4	THEORY OF OPERATION	4-1
4.1	SCOPE	4-1
4.5	GENERAL DESCRIPTION	4-1
4.12	CIRCUIT DESCRIPTIONS	4-3
4.13	NULL DETECTOR (Schematic 430351)	4-3
4.19	DECADES (Schematic 430363)	
4.24	SEQUENCE LOGIC (Schematic 430348)	4-7
4.33	CONTROL LOGIC (Schematic 430686)	4-9
4.39	REFERENCE AND BUFFER AMPLIFIER (Schematic 430350)	4-9
5	RECALIBRATION	5-1
6	DRAWINGS	6-1
6.2	PARTS LISTS	6-1

Digitized by the Internet Archive
in 2025

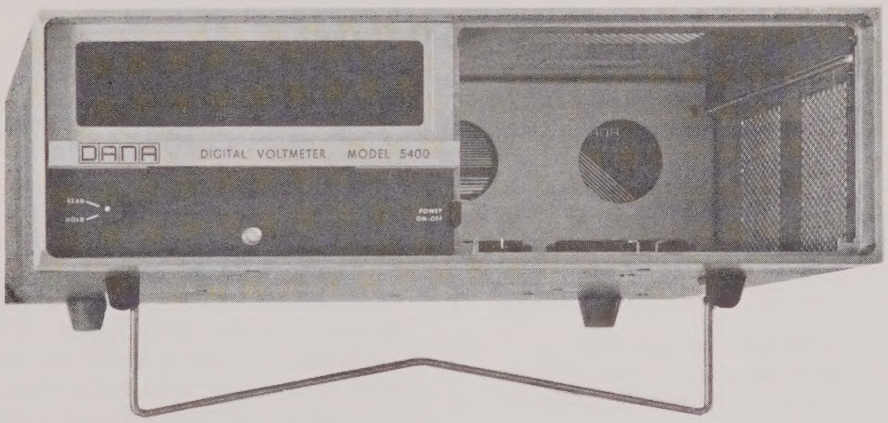
https://archive.org/details/manualsplus_10423

List Of Illustrations

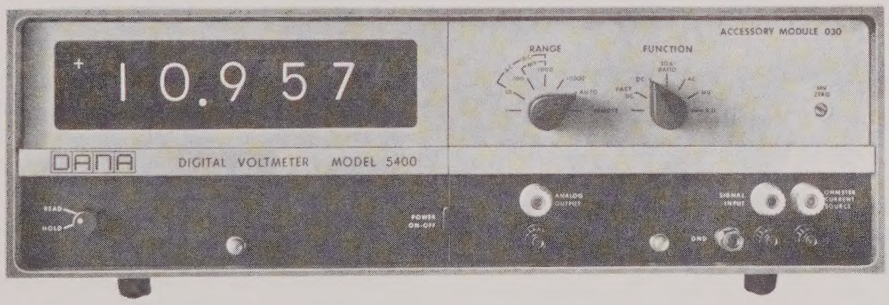
Figure	Title	Page
1.1	Model 5400/5403 Digital Voltmeter	vi
1.2	Component Location	1-2
1.3	Digitizing and Display Module - Block Diagram	1-3
4.1	Dana Logic Symbols	4-1
4.2	Block Diagram - Digitizing Module	4-2
4.3	Timing Diagram (Without Overrange)	4-4
4.4	Timing Diagram (With Overrange)	4-5
4.5	Typical DAC Switch	4-6
4.6	Functional Intraconnection, Digitizing and Display Module	4-11

LIST OF TABLES

Table	Title	Page
1.1	Circuit Board Locations	1-3
1.2	Specifications	1-5
2.1	Mating Connector Identification	2-2



(a) Model 5400 Digitizing & Display Module



(b) Model 5400 with 030 Accessory Module

Figure 1.1. Model 5400 Digital Voltmeter

Section 1

General Description

1.1 INTRODUCTION

1.2. This manual describes the digitizing and display module of the Dana Model 5400 and Model 5403 Digital Voltmeter. This module, located in the left-hand side of the instrument (Figure 1.1), operates in conjunction with one of the Dana accessory modules. The accessory module is a signal conditioning unit that provides a ten-volt full-scale (plus overrange) analog voltage to the digitizing and display module. The accessory module is located on the right-hand side of the instrument and is described in a separate manual.

1.3. Models 5400 and 5403 differ only in the type of Electrical Output/Remote Programming accessory available as options. Model 5400 operates with a non-isolated accessory and is suitable for applications in which the program source and the digital output device are isolated from ground. Model 5403 operates with an accessory equipped with isolating relays allowing its use with grounded program sources and output devices. A special power supply is required by Model 5403 to drive the isolating relays. Otherwise, the two models are similar. References in this manual to "Model 5400" refer to both Model 5400 and Model 5403, unless otherwise indicated.

1.4. The Digital Voltmeter output is presented on a four-digit visual display. Accuracy is preserved at the range cross-over points by a fifth overrange digit that extends each range by 10% (9999 to 10999). The output/programming options are described in the separate "Electrical Output and Programming Options" manual.

1.5. All circuits, other than the power supply, are mounted on plug-in circuit boards. The power supply is common to the accessory and digitizing modules and is located at the right rear of the instrument (Figure 1.2). Next to the power supply, at the left rear of the instrument, is the optional Electrical Output and Programming Unit. The location of the circuit boards is shown in Table 1.1. A block diagram showing their electrical arrangement is shown in Figure 1.3.

1.6 OPERATIONAL DESCRIPTION

1.7. The Dana Model 5400 Digital Voltmeter uses the null balance technique to measure the amplitude of unknown voltages. The accessory module converts the input signal to a 10-volt full-scale analog voltage. For example, if the controls are set to measure AC volts on the 100-volt range, a 50-volt rms input signal results in an internal analog voltage of 5 volts DC. This voltage is applied to the Digitizing and Display module where it is "digitized" by comparison with a series of trial-ane-error voltages, each of which is a known digital fraction of a reference voltage. Precision resis-

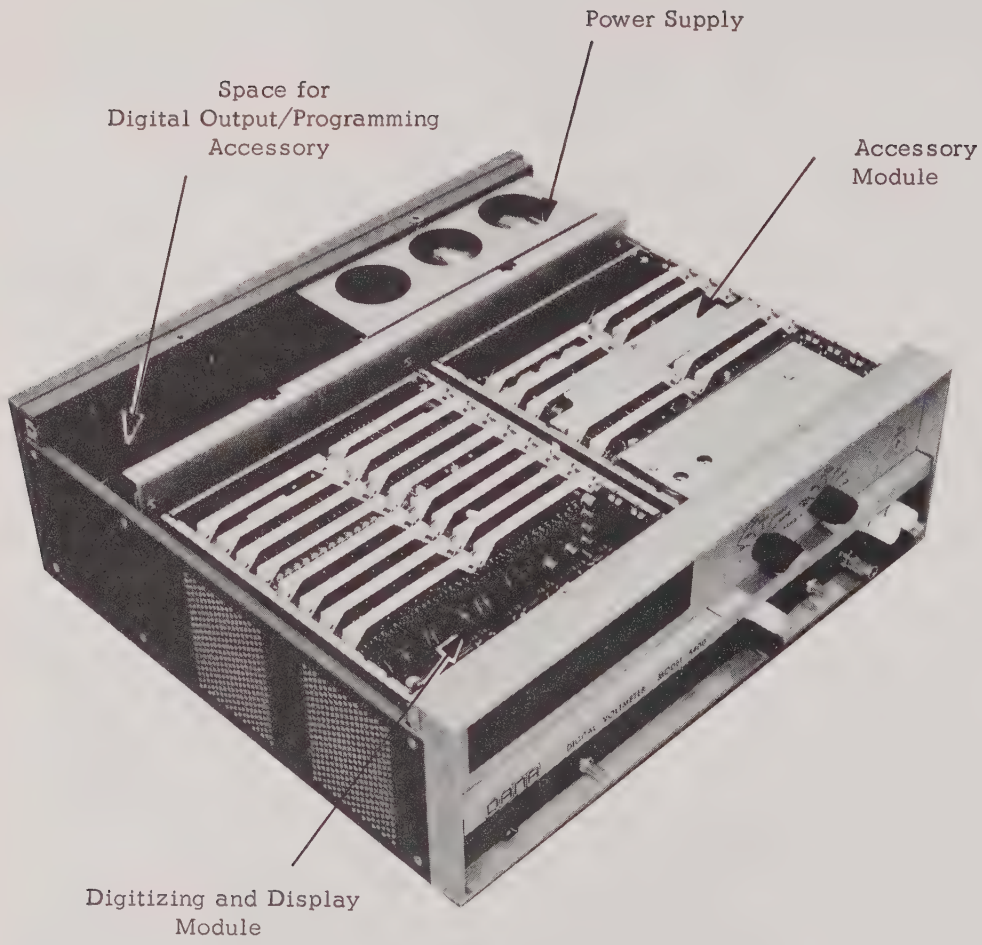


Figure 1.2. Component Location

Table 1.1
Circuit Board Locations

ELECTRICAL OUTPUT AND PROGRAMMING	POWER SUPPLY
J11 - Reference Buffer J10 - Control Logic J 9 - Sequence Logic J 8 - Null Detector J 7 - 1 Decade J 6 - 10 Decade J 5 - 100 Decade J 4 - 1000 Decade J 1 - Display	Accessory Module

Control Panel

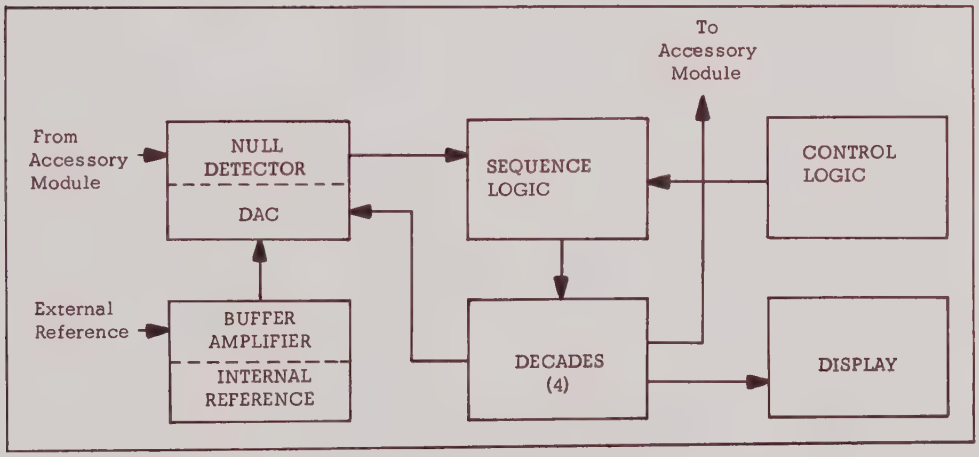


Figure 1.3. Digitizing and Display Module — Block Diagram

tors in the reference-current divider or digital-to-analog converter (DAC) are capable of dividing the reference into 10,000 equally-spaced current increments and to arrive at the closest increment in a maximum of 36 trials. The total digitizing time is less than 2 milliseconds.

1.8. When a null balance has been achieved, the digital setting of the DAC is displayed on the DVM visual readout. The number shown is, in effect, the ratio between the input signal and the reference voltage in parts per 10,000.

1.9. When absolute measurements are being made, a highly stable, Zener-controlled, 10-volt internal reference is used. Since full scale analog voltage from the Signal Conditioning module is also 10 volts (converted to a precision current), the displayed value is read directly in DC volts, millivolts, AC volts or kilohms, with proper placement of the decimal point to adjust for any ranging that has been performed.

1.10 In the above example, the 50-volt rms AC input signal would produce a 5-volt internal analog voltage, which would be balanced by the 10-volt internal reference when the DAC arrives at a value of 5,000 (parts per 10,000). The digital display would carry the numerals 5-0-0-0, and range information from the Signal Conditioning module would place the decimal point to read 50.00. An indicator symbol on the display would show that AC volts were being measured.

1.11. In the ratio measuring mode, the internal 10-volt reference is replaced by an external DC voltage, which may vary from ± 1 to +11 volts. The displayed value is the ratio between a DC input signal and the reference voltage at that instant. The ratio between +DC voltages and the reference are shown as plus (+) ratios; the ratio between -DC voltages and the reference as minus (-) ratios (the external reference must always be positive). This bipolar ratio capability is of particular value in applications, such as bridge balancing, where inputs are likely to pass through zero. Since the signal and reference voltages are being detected simultaneously, the accuracy of the ratio measurement is independent of the stability of the voltage source.

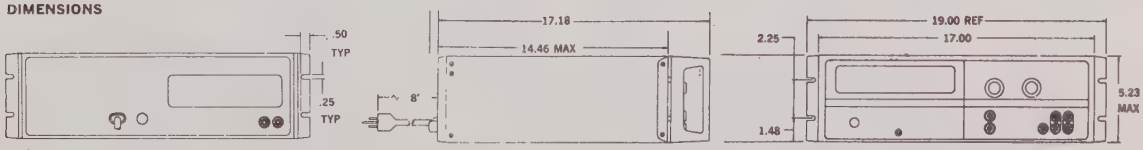
1.12 SPECIFICATIONS

1.13. Specifications of the Model 5400/5403 are listed in Table 1.2.

Table 1.2. Specifications

DC VOLTAGE MEASUREMENTS	**ABSOLUTE (0 to ± 1000 v)**	**RATIOS (+1 to +11 v ref std, +10 to +110 available)**
Full scale ranges, ranging and polarity automatic	±10.999, ±109.99, ±1099.9 v (max input 1000 v)	±1.0999:1, ±10.999:1, ±109.99:1
Accuracy (90 days)	±0.01% of reading ±0.01% of f.s.	±0.01% of reading ±0.01 (10v/E ref)% of f.s.
Temperature coefficient	±0.001% of f.s. per °C	same as absolute
Response time: Digitizing with polarity change	2 milliseconds	same as absolute
Range change (READ mode)	250 milliseconds per range	same as absolute
Full scale step function settling time (to 0.01%)	500 milliseconds with up to 100k-ohm source	same as absolute
Common mode rejection: DC	error <0.01% f.s. per 100 v common mode, with up to 100 ohms in either lead	same as absolute
AC, 61 Hz and below	error <0.01% f.s. per 10 v common mode, with up to 100 ohms in either lead	same as absolute
Normal mode noise rejection	60 dB min at 59 Hz increasing at 18 dB/octave to 80 dB at 400 Hz, 60 dB min from 400 Hz to 100 kHz	same as absolute
Input resistance — at or off null: 10 v range	1000 megohms	signal, 1000 megohms; ref, 20 megohms
other ranges	10 megohms	signal, 10 megohms; ref, 20 megohms
DV VOLTAGE MEASUREMENTS, FAST		
Full scale ranges, ranging and polarity automatic	±10.999, ±109.99, ±1099.9 volts (max input 1000 volts)	
Accuracy (90 days)	±0.01% of reading ±0.01% of f.s.	
Temperature coefficient	±0.001% of f.s. per °C	
Response time: Digitizing with polarity change	2 milliseconds	
Range change (READ mode)	250 milliseconds per range	
Full scale step function settling time (to 0.01%)	15 milliseconds with up to 100k-ohm source	
Common mode rejection: DC	error <0.01% f.s. per 100 v common mode, with up to 100 ohms in either lead	
AC, 61 Hz and below	error <0.01% f.s. per 3 v common mode, with up to 100 ohms in either lead	
Input resistance — at or off null: 10 v range	1000 megohms	
other ranges	10 megohms	
MILLIVOLT MEASUREMENTS (MODULE 031 ONLY)		
Full scale ranges, ranging and polarity automatic	±109.999, ±1099.9 millivolts	
Accuracy (90 days)	±0.01% of reading ±0.02% of f.s.	
Response time: Digitizing with polarity change	2 milliseconds	
Range change (READ mode)	250 milliseconds/per range	
Full scale step function settling time (to 0.01%)	1 second	
Common mode rejection: DC	error <0.01% f.s. per 10 v common mode, with up to 100 ohms in either lead	
AC, 61 Hz and below	error <0.01% f.s. per 10 v common mode, with up to 100 ohms in either lead	
Normal mode noise rejection	40 dB min, 59 Hz and up; increasing 12 dB/octave (36 dB min, 49 Hz and up)	
Input resistance	100 megohms	
ACCESSORIES (MODULE 031 ONLY)	**MODEL 29 AC CONVERTER**	**MODEL 07 OHMS CONVERTER**
Maximum voltage rating	500 v rms, 50 Hz to 10 kHz, decreasing to 150 v at 50 kHz and up	not applicable
Maximum voltage across unknown	not applicable	10 v at f.s., max current 10 ma on 1 k range
Full scale ranges, ranging automatic	1.0999, 10.999, 109.99, 1099.9 v rms	1.0999, 10.999, 109.99, 1099.9, 10999 kilohms
Accuracy (90 days): 10, 100, 1000 ranges	50 Hz to 10 kHz: ±0.08% rdg ±0.02% f.s.	1, 10 and 100 ranges: ±0.01% of reading ±0.01% f.s.
	10 kHz to 50 kHz: ±0.2% rdg ±0.05% f.s.	1000 range: ±0.03% of reading ±0.01% f.s.
	50 kHz to 100 kHz: ±0.9 rdg ±0.1% f.s.	10,000 range: ±0.07% of reading ±0.05% f.s.
1 range	50 Hz to 10 kHz: ±0.18% rdg ±0.02% f.s.	
Response time: Digitizing	2 milliseconds	2 milliseconds
Range change (READ mode)	250 milliseconds per range	250 milliseconds per range
Full scale step function settling time	0.3 second (to 0.1%)	1, 10, 100 kilohm ranges: 2 sec; 1 meg range: 3 sec; 10 meg range: 2 sec plus 1 sec/meg (to 0.01%)
Common mode rejection: DC	not applicable	not applicable
AC, 61 Hz and below	error <0.01% f.s. per 10 v common mode, with up to 100 ohms in either lead	not applicable
Input resistance (all ranges)	1 megohm in series with 0.22 microfarad	not applicable
Shunt capacitance at terminals	front input: less than 140 pF; Parallel rear input: less than 200 pf.	not applicable
GENERAL SPECIFICATIONS AND ORDERING INFORMATION:		
Measurement rate in READ mode	4 readings/sec	
Maximum common mode voltage	250 volts	
Maximum power requirement	60 watts, 105 to 125 v (export 210 to 250 v), 50 to 400 Hz	
Warm up	1/2 hour to full accuracy	
Operating temperature range	0° to 50°C; specs apply from +18° to +30°C	
Weight	25 pounds (approx) net, 30 pounds (approx) shipping	
Analog electrical output	10 v f.s. at 1 milliamp. Accuracy: dc and ohms, ±1 mv; ac same as Model 29. Output resistance: 5 Ω	

DIMENSIONS



BACK SIDE FRONT

Section 2

Installation

2.1 UNPACKING AND INSPECTION

2.2. The Model 5400 Digital Voltmeter is crated in a plastic foam container consisting of two half-forms joined together and securely taped. The forms are contoured so as to hold the digital voltmeter firmly in place with the container absorbing any reasonable external shock. Before uncrating, examine the container for any sign of external damage.

2.3. Carefully cut the tape holding the two half-forms together and remove the digital voltmeter. Inspect the digital voltmeter for signs of damage. If damage is found, notify the carrier immediately.

2.4. Remove the two modules from the DVM enclosure by turning the knurled knobs counterclockwise and pulling on the aluminum channel across the front panel of each module. Be sure that all circuit boards are firmly seated in their connectors. Normally, there is no need to remove each board; however, a visual check for obvious damage should be made.

2.5. Reseat the modules by pressing them firmly into the connectors at the rear of each drawer assembly. Lock in place by turning the knurled knobs fully clockwise.

2.6. The Model 5400, as shipped, is designed for bench-top operation. A standup bracket is provided under the case to aid in reading the visual display. To adapt the Model 5400 for rack mounting, flanges are attached by removing the two screws holding the side panels to the front bezel casting and replacing them with the longer screws provided with the rack-mounting flanges. The flanges are supplied in pairs, with Part No. F-450820 applying to a pair of flanges alone. For integral flanges and carrying handles, specify Part No. FH-450820. For carrying handles only, specify Part No. H-450820.

2.7 POWER CONNECTIONS

2.8. A standard eight-foot, three-wire, power cable is supplied with the instrument. This cord connects to a three-pin power connector at the rear of the unit.

2.9 INPUT/OUTPUT CONNECTIONS

2.10 Inputs/Analog Output

2.11. Signal input and analog output binding posts are located on the front of the accessory module (accessory 005 has no analog output). Binding posts for the reference input, used for ratio measurements, are located on the rear of the instrument (except on 005). Connection to these terminals are made with standard "banana" plugs. Models equipped with a rear input connector (designated as Model 5400-1) use a

six-pin cable connector wired in parallel with the front-panel binding posts. The mating connector is supplied with the instrument. Refer to the instruction manual covering the accessory module for pin assignments of the rear input connector and for instructions on use of the analog output.

2.12 REMOTE PROGRAMMING/ ELECTRICAL OUTPUT

2.13. The Remote Programming/Electrical Output accessory fits into the rear panel of the digital voltmeter enclosure. It carries two 50-pin connectors. The connector on the right-hand side (as viewed from the rear) is the Digital Output connector, J202. The left-hand connector is the Remote Programming Input connector, J204. Printers and other digital recording devices may be driven by the voltage-levels present on the pins of the Digital Output connector. Pin assignments of the two connectors are given in the "Pin Assignments and Coding" chart for the particular option. The charts are included in the "Model 5400 Electrical Output and Programming Options" manual along with instructions for wiring each option and directions for programming.

NOTE: Refer also to the Installation instructions (Section 2) of the accessory module instruction manual.

Connector	Dana P/N	Mfr.	P/N
Digital Output J202	600015	Amphenol	57-40500
Mating Connector	600047	Amphenol	57-30500
Rear Input J203	600259	Amphenol	97-3102A-14S-6S-639
Mating Connector	600260	Amphenol	97-3106A-14S-6P-639
Hood	601639	Amphenol	97-3057-6A-639
Remote Programming J204	600015	Amphenol	57-40500
Mating Connector	600047	Amphenol	57-30500

Table 2.1. Mating Connector Identification

Section 3

Operation

Since operation of the instrument depends on the accessory module used, refer to "Operation" of the appropriate accessory manual.

Section 4

Theory Of Operation

4.1 SCOPE

4.2. This section covers theory of the Model 5400 Digitizing and Display Module. Refer to the Accessory Module instruction manual for theory of operation of that unit.

4.3. The last figure in this section, figure 4. , is a functional intraconnection diagram of the Digitizing and Display module. The figure can be unfolded allowing the diagram to be referenced while reading the circuit descriptions throughout this section.

4.4. The descriptions and simplified diagrams in this section are intended to supplement the complete schematics included in Section 6. Logic symbols used in the diagrams are defined in Figure 4.1.

4.5 GENERAL DESCRIPTION

4.6. A simplified drawing of the Model 5400 Digitizing and Display module is shown in Figure 4.2. Inputs from the Accessory module are applied to a summing junction at the input to the Null Detector. Regardless of the polarity of the voltage being measured, the sum of the currents from the accessory module is always -2mA full scale.

4.7. DAC current supplied to the summing junction is the analog equivalent of the digital value represented by the state of the Decade flip-flops. When the summing junction is brought to null, the state of the flip-flops indicates exact digital value of the input signal.

4.8. The digitizing process, or "conversion", begins when the Start/Stop

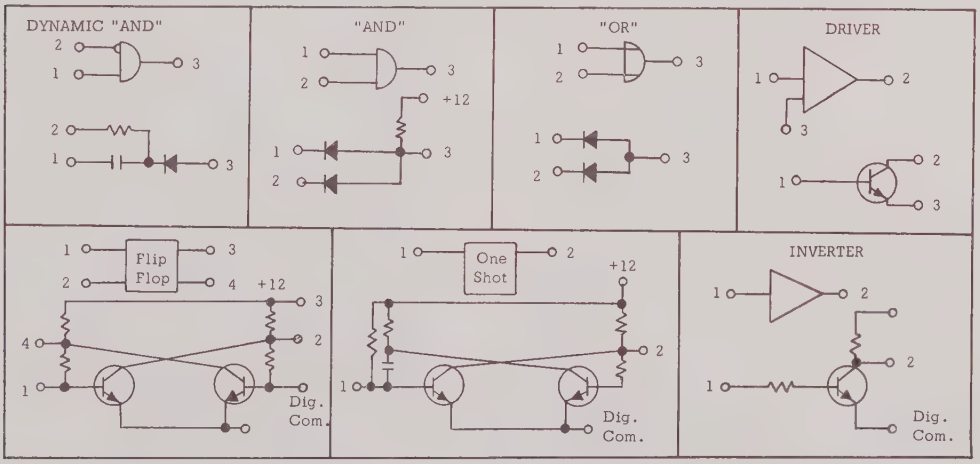


Figure 4.1. Dana Logic Symbols

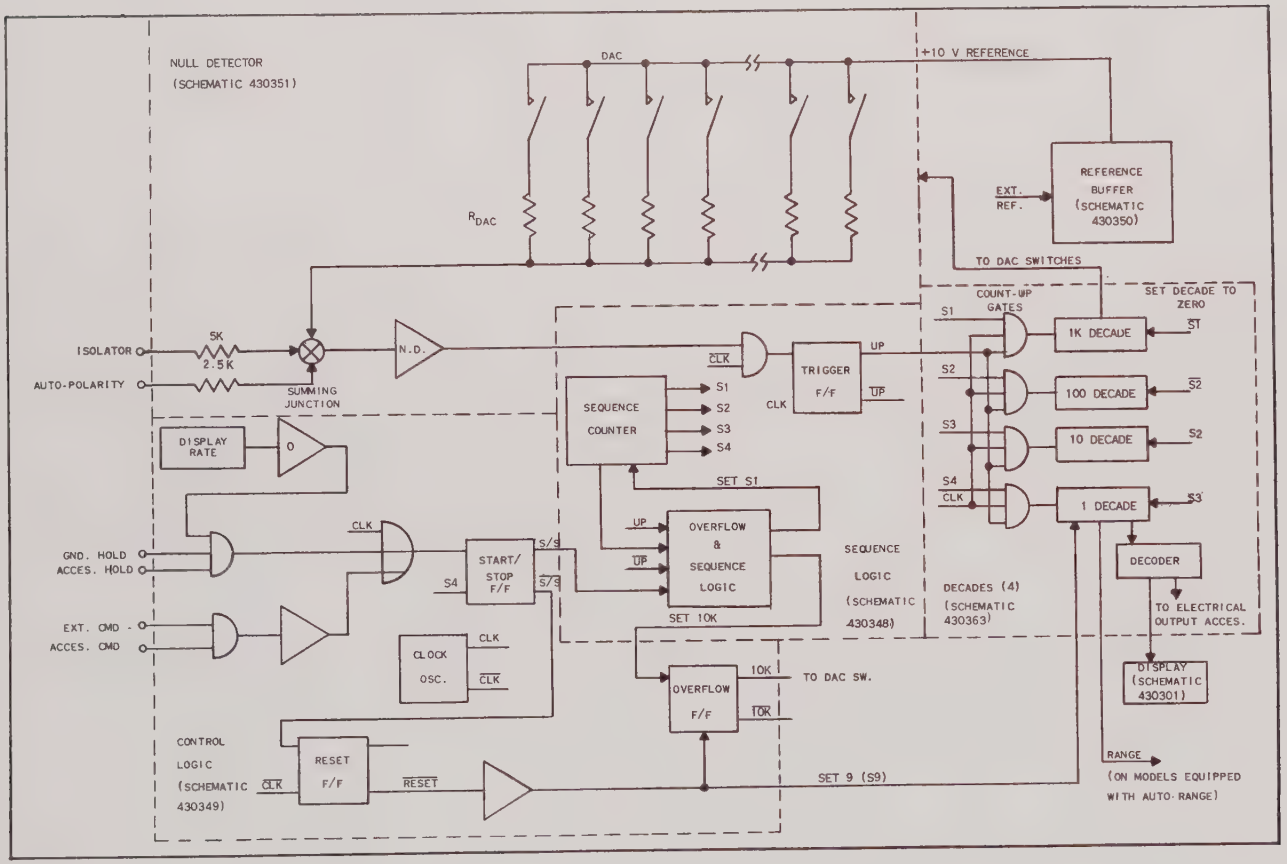


Figure 4.2 - Block Diagram - Digitizing Module

flip-flop (on the Control Logic board) is set. Start/Stop is set by either of two conditions. The Display Rate circuit turns it on automatically every 250 milliseconds unless inhibited by a ground level at the Ground Hold input (READ/HOLD switch on HOLD) or a ground level at the Accessory Hold input. Start/Stop is also set by an external Command received through the remote programming input — or by an accessory command if the instrument is so equipped.

4.9. As Start/Stop is set, the negative-going edge of START/STOP sets the Reset flip-flop. RESET is inverted to become S9 (Set 9) and applied to each of the Decades. Each Decade has four flip-flops, representing 2*-4-2-1 for that Decade. S9 sets the Decades to 9999. If, with the four Decades set to nines, DAC current is less than the input, the Overflow flip-flop is turned on by Overflow detecting logic on the Sequence Logic board. This adds additional DAC current representing a fifth digit (10K). If the resulting DAC current is still too low, the digitizing cycle is completed and the unit is made to up-range. If no higher range is available or permitted, the over-range condition (10999) may be printed to indicate an excessive input.

4.10. Normally, however, the initial setting of 9999 results in a DAC current greater than the input current. This condition is detected by logic on the Sequence Logic board; the Sequence Counter is stepped to sequence state 1 (S1).

4.11. In S1, the 1K Decade is "dropped" (each flip-flop "off"). The Decades are now set to 0999. If the resulting DAC current is less than the input current, the Null Detector causes the generation of UP at the Trigger flip-flop. The 1K Decade now counts up on each clock pulse until DAC current becomes equal to or greater than the input current. This condition is indicated by UP going "false". The Sequencer then advances to S2 and the 100 Decade is "dropped". If DAC current is less than the input current, the 100 Decade is counted up in the same manner as the 1K Decade. This is repeated for each succeeding Decade. At the end of S4, during which the 1 Decade is counted up, the Start/Stop flip-flop is turned off. At this time, the state of the Decades represents the digital value of the input signal and the conversion is complete. This operation is illustrated in the timing diagram of Figure 4.3. In the illustration the input is 03456. Figure 4.4 shows the timing with an input of 10756 (overrange).

4.12 CIRCUIT DESCRIPTIONS

4.13 NULL DETECTOR (Schematic 430351)

4.14. There are two main elements on the Null Detector circuit board. The precision DAC (digital/analog converter) resistor matrix is controlled by the state of the Decade flip-flops. The Null Detector itself is an amplifier that detects and amplifies any difference in input current and DAC current.

4.15. A summing junction at the input to the Null Detector receives inputs from the Accessory Module. (Typically, the inputs from the Accessory Module are from the Isolator and Auto Polarity circuits although on certain accessory modules, special circuits are used. Refer to the Accessory

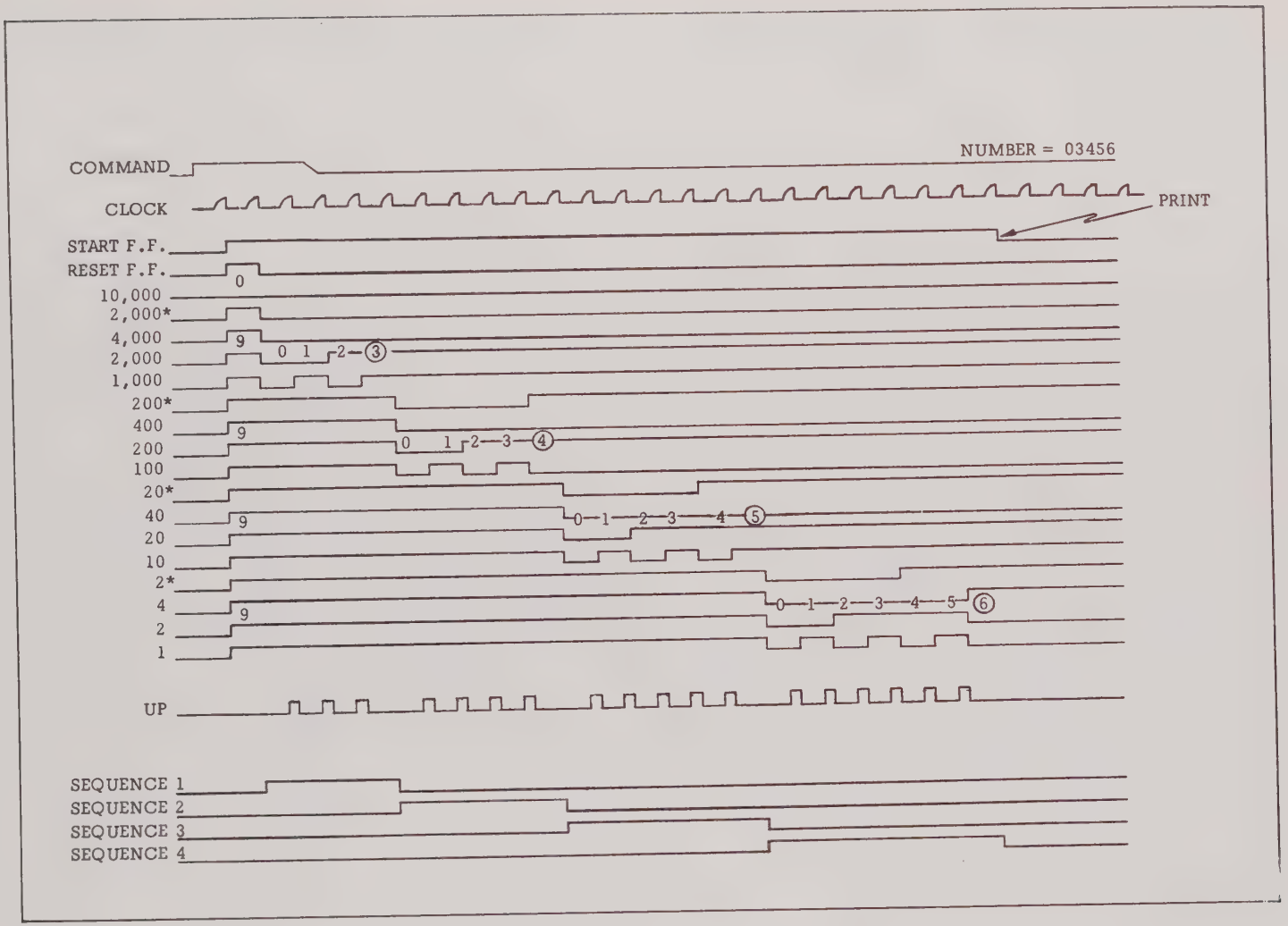


Figure 4.3 - Timing Diagram (Without Overrange)

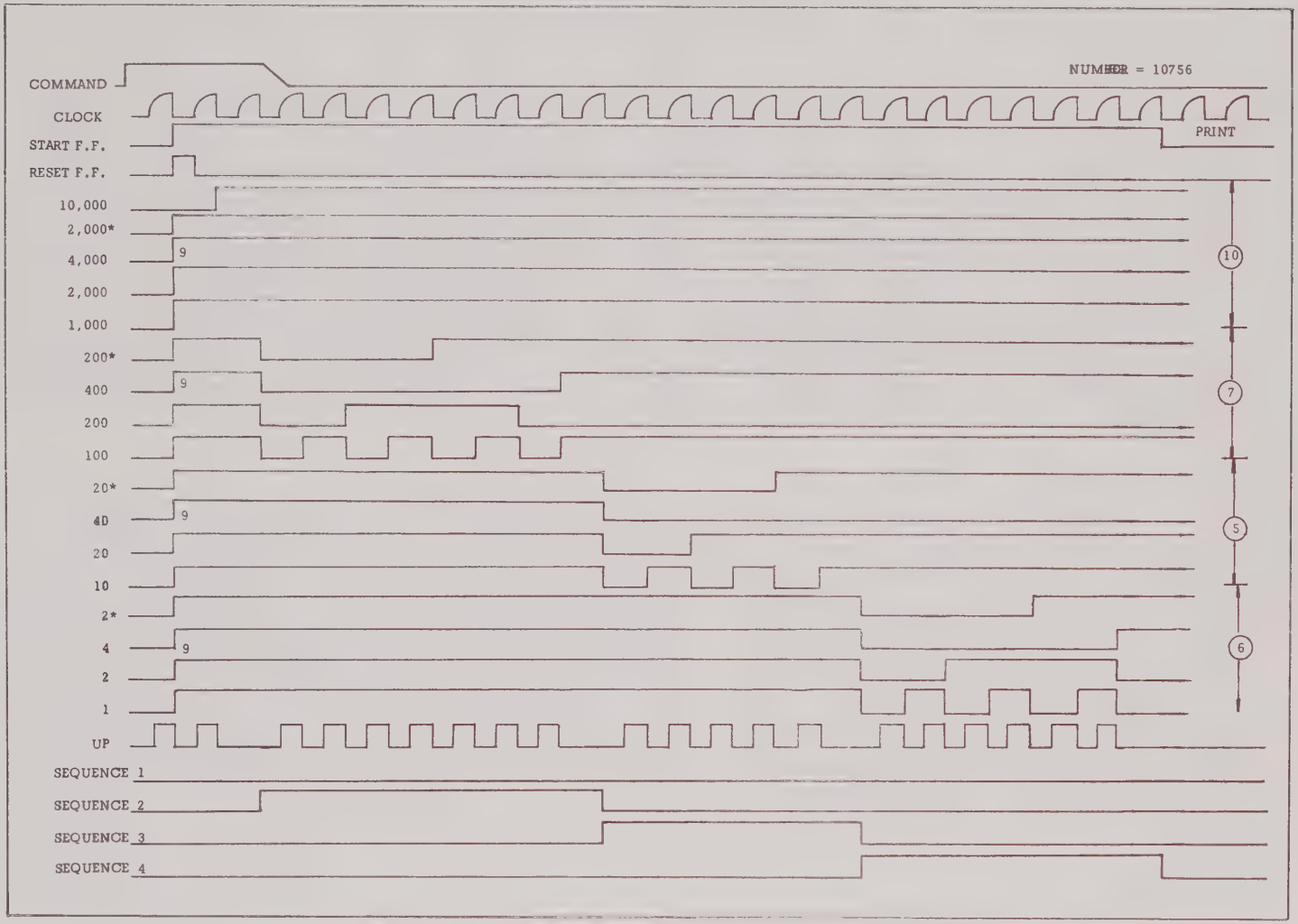


Figure 4.4. Timing Diagram (With Overrange)

Module instruction manual.) The input voltages are such that the sum of the current through the two input resistors is always negative. This can be seen by considering full-scale inputs to the instrument of both polarities (scaled 10 volts). With a negative input voltage, the Auto Polarity voltage is zero. Therefore, the current through the 2.5K resistor is -2mA (-10/5K). With a positive input voltage, the Auto Polarity output is 10 volts applied back through the negative feedback leg of the Auto Polarity amplifier. This results in current through the 2.5K resistor of -4mA. At the same time the Isolator output is +10 volts resulting in +2mA through the 5K resistor (10/5K). The sum of the two currents (-4mA and +2mA) is -2mA.

4.16. The negative current is balanced out by a positive current from the DAC resistor network. The current is developed from a precise 10-volt reference voltage from the Reference Buffer circuit board for absolute measurements or from an external reference when ratios are being measured. In the initial condition where all four Decades are set to 9, the resistors are all switched into the DAC circuit. Since the resistors are in parallel, the resulting DAC current is maximum.

4.17. A typical DAC switch is shown in Figure 4.5. Q2 is normally on and R_{DAC} is in the circuit. When a positive voltage is applied to the base of Q1, Q1 is turned on and the resulting ground level at the base of Q2 back biases Q2 and R_{DAC} is out of the circuit. As shown in the figure, the switch is operated by the "not" side of the Decade flip-flop. When the flip-flop is "off" ("not" side true), the resistor is out of the circuit. Therefore, as a decade is counted up, resistance is added in parallel and DAC current increases at each step.

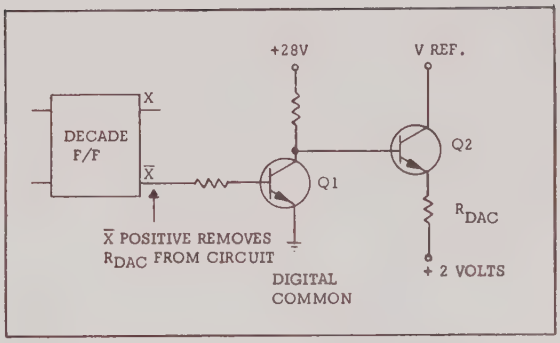


Figure 4.6. Typical DAC Switch

4.18. The positive DAC current is applied to the summing junction at the Null Detector input. If the DAC current is greater than the negative current from the Signal Conditioning module, the resulting current is positive; if the Signal Conditioning input is greater, the resulting current is negative. The Null Detector is a high-gain amplifier that provides an output of sufficient amplitude to trigger the Trigger flip-flop only when the input (summing junction) is negative. The Trigger flip-flop is located on the Sequence Logic board; its output is the UP signal. UP and its complement, $\overline{UP}$, control generation of the sequence states which, in turn control the counting operation of the Decades.

4.19 DECADES (Schematic 430390)

4.20. There are four Decade boards in the instrument, all identical. The Decade board nearest the front of the instrument controls the 1000 digit; the 100 digit; the third, the 10 digit; and the fourth, the 1 digit.

4.21. At the beginning of a conversion, after the Start/Stop and Delay flip-

flops are set, the S9 line is made "true". This applies a positive voltage through R to the reset side of each flip-flop. This voltage sets each flip-flop and represents the 09999 condition. If the Null Detector indicates that 9999 is greater than the input signal, the Sequence Logic places the instrument in sequence state 1 (S1). S1 is applied to the C_O input of the 1K Decade. As S1 goes "true", the negative-going edge of $\overline{S1}$ places a negative voltage on the reset input of the flip-flop, thereby resetting it to zero. The "true" output of the flip-flop as it goes "false" (on negative-going edge). Each flip-flop on the 1K Decade is now "off" and the value represented by the four Decades has changed from 9999 to 0999. S1 is applied to the input gate along with UP and a clock pulse. The Decade counter now counts up on each clock pulse. (SX, shown on the diagram, represents S1 to the 1K Decade, S2 to the 100 Decade, S3 to the 10 Decade, and S4 to the 1 Decade). Counting continues until UP goes FALSE. At this time, the Sequence Logic places the instrument in sequence state 2 (S2) and the 100 Decade is reset by S2 applied to the C_O input. The count-up operation proceeds exactly as in the 1K Decade, except that the input gate is now enabled by S2. The 10 Decade and 1 Decade counting operations begin on following UP signals. At the end of the 1 Decade counting operation (S4), the Sequence Logic counter and Start/Stop flip-flop are reset and no further sequence states are generated until the Start/Stop flip-flop is again set.

4.22. The "and" gates at the inputs to the 2 and 2* flip-flops adjust the count to eliminate "forbidden codes". Additional logic on each decade detect the "zero" and "nine" states of the Decade for use of the range circuits in the Accessory Module.

4.23. Also included on the Decade circuit board is a Decoder that interprets the State of the flip-flops and produces the drive voltage for the numerical display and the BCD data to the Electrical Output accessory. There are five lines to the lamp, each representing a pair of numerals: 0 and 1, 2 and 3, 4 and 5, etc. Separate control lines determine whether the even or odd numeral is to be lit. During the digitizing cycle, a blanking signal inhibits both the odd and even enable lines.

4.24 SEQUENCE LOGIC (Schematic 430348)

4.25. A counter on the Sequence Logic circuit board generates the four sequence states — of periods during which each Decade is reset to zero and then counted up. In addition, logic gates on the board determine when the sequence counter is turned on — and also detect the "overrange" condition where the input exceeds the four digit capability of that range. Operation of the Sequence Logic is described in the following paragraphs; in the first case, it is assumed that the input does not require the overflow function.

4.26. Initially, each Decade is set to nine, the Overflow flip-flop (on Control Logic board) is off, and each flip-flop in the sequence counter is off. In this assumed case, the value represented by the Decade setting of 9999 is greater than the input signal; therefore the Trigger flip-flop is not turned on and UP is "true." UP enables an "and" gate which causes the S1 (sequence

state 1) flip-flop to be set. Other inputs to the "and" gate are the clock Start/Stop, and the "false" side of the sequence counter flip-flops to assure that S1 is not set by any time other than at the start of a conversion.

4.27. As S1 goes "true", $\overline{S1}$ goes "false". The negative-going edge of $\overline{S1}$ enables the input gate to allow the Decade to start counting. The 1K Decade counts up until $\overline{UP}$ is received. $\overline{UP}$ resets the S1 flip-flop in the sequence counter. On the negative-going edge of S1, flip-flop S2 is set. The negative-going edge of $\overline{S2}$ resets the 100 Decade to zero. S2 enables the input gate of the 100 Decade and it begins counting.

4.28. The Sequence counter advances to S3 on the next $\overline{UP}$ and the 10 Decade count operation is performed. Then S4 controls the counting of the 1 Decade. The 10 and 1 Decades are set to zero by S2 and S3 rather than $\overline{S3}$ and $\overline{S4}$ since their negative-going edges occur at the same time; this eliminates the need of bringing out two extra leads from the board. The negative-going edge of S4 resets the Start/Stop flip-flop.

4.29. The function of each sequence state can be summarized as follows:

- $\overline{S1}$ resets 1K Decade to zero (on negative-going edge);
- S1 enables 1K Decade count-up;
- $\overline{S2}$ resets 100 Decade to zero (on negative-going edge);
- S3 enables 10 Decade to zero (on negative-going edge);
- S4 enables 1 Decade count-up, and resets start/stop flip-flop (on negative-going edge).

4.30. The overrange condition exists when, after the Decades are initially set to 9999, an UP is received. This indicates that the value represented by the state of the Decades is full-scale but still less than the input signal. This condition is detected by an "and" gate on the Sequence Logic board which received the UP signal along with the clock, Start/Stop, and the "not" outputs of the sequence counter flip-flops. When UP enables this gate, a signal (Set 10K) is sent to the Control Logic board where it sets the overflow flip-flop. The overrange bit has a logical weight of 10,000. If the overrange bit is "true", the readout is 10XXX. For reasons of linearity and accuracy, the analog weight of the resistor associated with this bit is 1000. This requires that the 1K decade be set to 9; this results in a total weight of 9 + 1 or 10. The readout does not indicate 19999, but the true analog weight of 10999.

4.31. If, after the overrange bit is set, the new comparison at the Null Detector results in an $\overline{UP}$, this indicates that the input is some value between 9999 and 10999. The negative-going edge of $\overline{10K}$ places the instrument into sequence state 3 and the conversion proceeds as described before, but with the 1K position remaining at 9 and the 100 Decade the first Decade "dropped".

4.32. If, after the overflow bit is set, an UP is received — indicating that 10999 is still less than the input, a digitizing cycle is performed and the unit is made to up-range (if instrument equipped for auto range). If no higher range is available, the overrange indication of 10999 is displayed (printed) to indicate an excessive input.

4.33 CONTROL LOGIC
(Schematic 430686)

4.34. The conversion operation begins when the Start/Stop flip-flop is set. Start/Stop is set either automatically, by the Display Rate circuit, or by an external command.

4.35. The Display Rate circuit is an oscillator which delivers a pulse every 250 milliseconds when the READ/HOLD switch is in the READ position. The oscillator output is inverted and applied to an "and" gate. The gate is inhibited by Ground Hold when the READ/HOLD switch is in HOLD — or by Accessory Hold if the line is at ground level. The Start/Stop flip-flop is set on the negative-going edge of the Display Rate signal. Start/Stop is also set when an external command is received through the programming input or by Accessory Command.

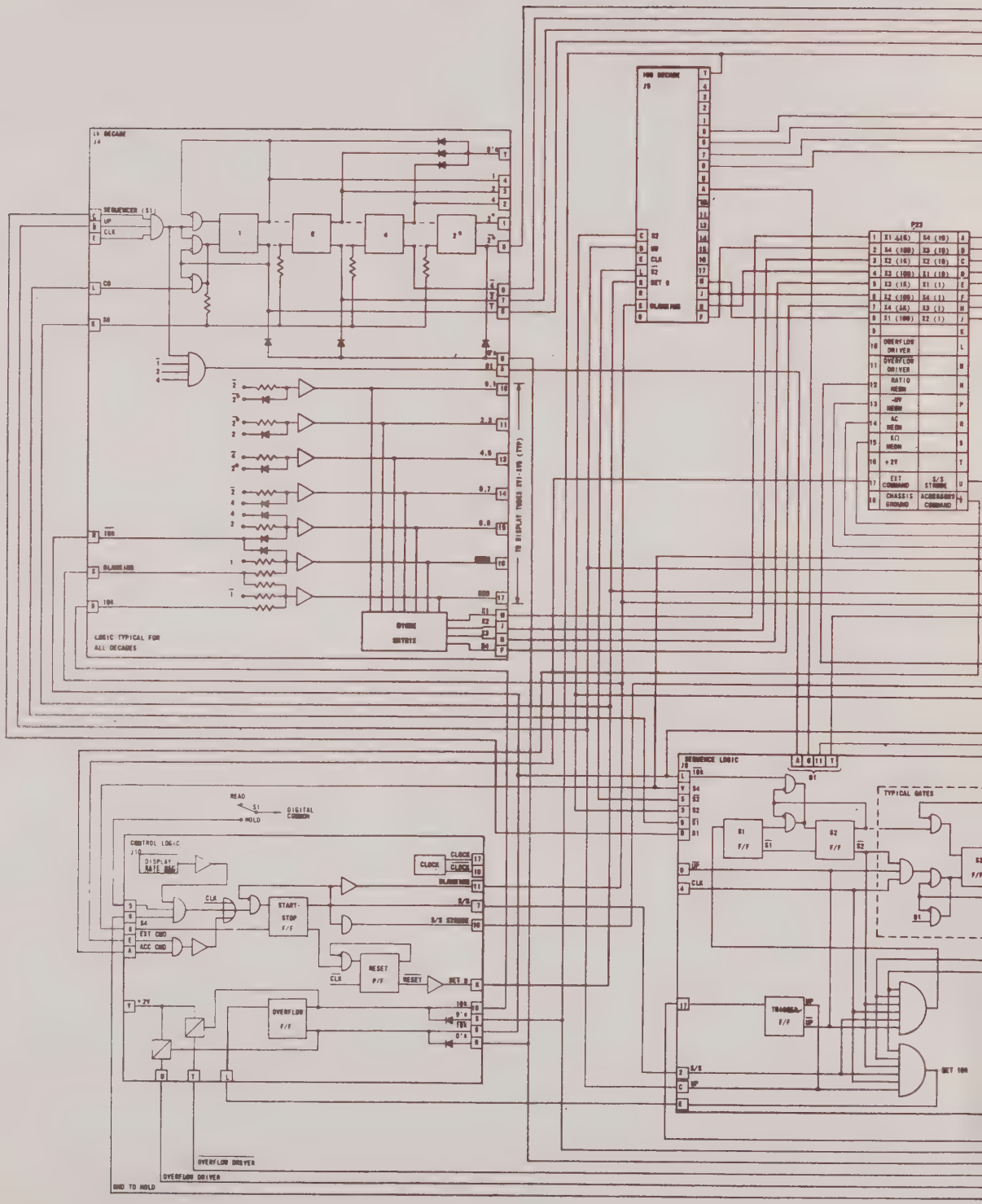
4.36. As Start/Stop (S/S) is set, the negative-going edge of $\overline{S/S}$ sets the Reset flip-flop. RESET is applied through an inverter to the Decades as S9 (Set 9). It sets the Decades to 9999 and resets the Overflop flip-flop to zero. The Reset flip-flop is turned off by the next CLOCK.

4.37. The "true" output of the Start/Stop flip-flop is applied to an inverter. The inverter output is the blanking level which biases off the display lamps during the digitizing process. At the end of a conversion, Start/Stop is turned off by S7 (negative-going). This releases the blanking signal and, at that time, the state of the Decades is displayed.

4.38. The Overflow flip-flop is set by the Set 10K signal from the Sequence Logic board. Its output operates a corresponding DAC switch in the Null Detector representing a "1" digit in the 10K position. This feature allows an overrange voltage to be measured and displayed.

4.39. REFERENCE AND BUFFER AMPLIFIER (Schematic 430350)

4.40. The Reference and Buffer Amplifier board serves two functions: it produces a precise 10-volt internal reference output for absolute measurements, and it serves as a high-input impedance, low-output impednace, unity-gain, buffer amplifier for external reference voltages used in ratio measurements. A relay on the board (K1) switches the circuit from internal reference to external buffer when energized by the RATIO command from the FUNCTION switch or through the remote programming accessory. The internal reference circuit is based on the use of an aged Zener diode and is a divider network consisting of a fixed resistor, a potentiometer, and the Zener diode. The drive current for the Zener comes from the output of the Reference Buffer itself. Through careful selection of components and a balancing of the various resistances in the feedback network, an essentially zero temperature coefficient is achieved within the operating range of the instrument.


LOGIC TYPICAL FOR ALL DECADES
SEQUENCER (S1)
CONTROL LOGIC
START-STOP F/F
RESET F/F
OVERFLOW F/F
SEQUENCE LOGIC
TYPICAL GATES
S1 F/F
S2 F/F
TRIGGER F/F
OVERFLOW DRIVER
END TO HOLD
TO DISPLAY TUBES (TYP)

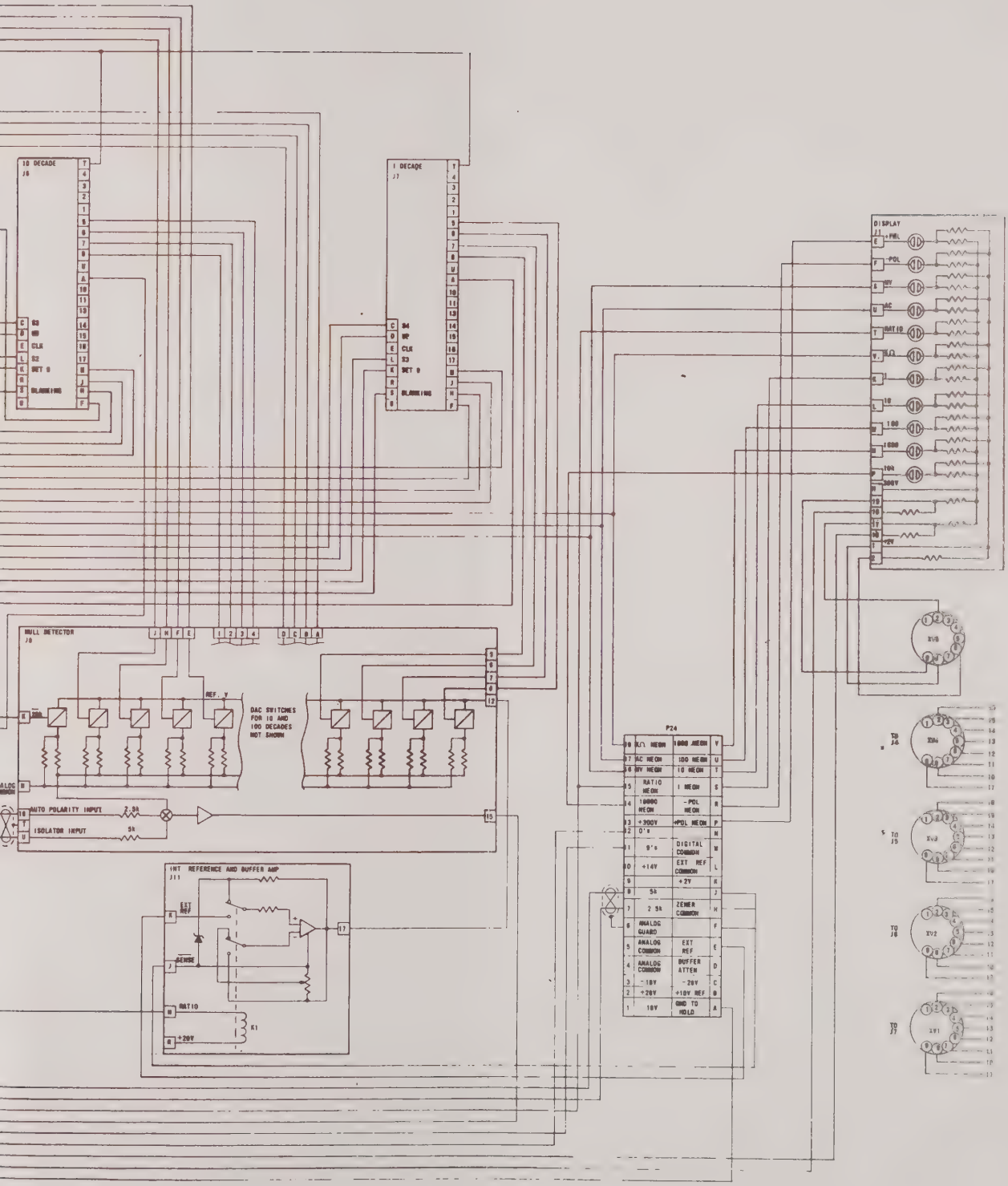


Figure 4.6. Functional Intraconnection, Digitizing and Display Module

Section 5

Recalibration

Recalibration of the Model 5400 Digital Voltmeter depends on the type of accessory module used. Refer to the appropriate accessory module instruction manual for procedures.

Section 6

Drawings

6.1 DRAWINGS

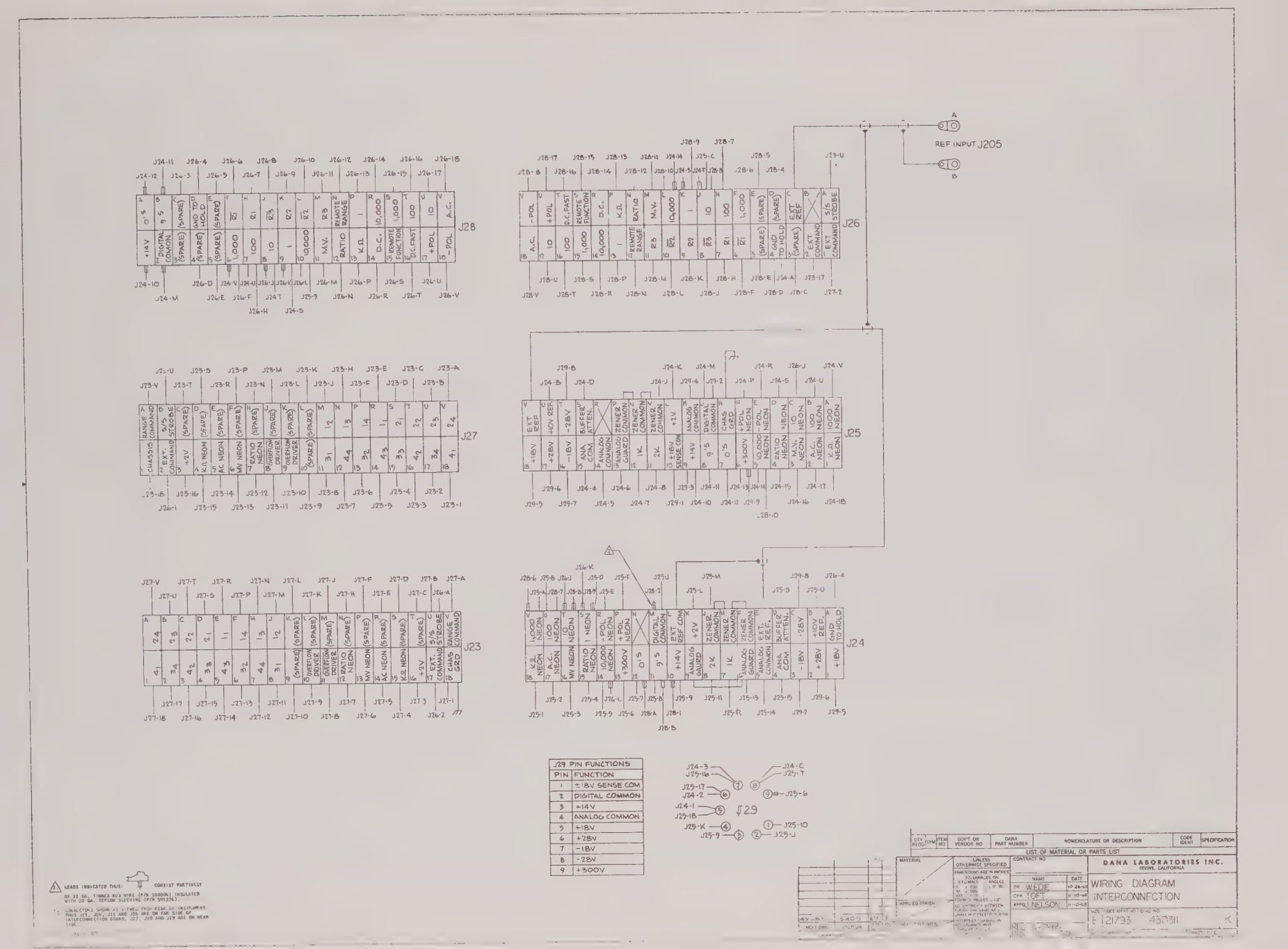
The following drawings are included in this section:

Wiring Diagram - Interconnection 5400	430311
Wiring Diagram - Interconnection 5403	430397
Wiring Diagram - Intraconnection	430362
Wiring Diagram - Intraconnection	430687*
PC Board Assembly - Display	400691
Schematic - Display	430301
PC Board Assembly - Basic Decade	400862
Schematic - Basic Decade	430363
PC Board Assembly - Basic Decade	400891*
Schematic - Basic Decade	430390*
PC Board Assembly - Null Detector	400843
Schematic - Null Detector	430351
PC Board Assembly - Sequence Logic	400688
Schematic - Sequence Logic	430348
PC Board Assembly - Control Logic	400689
Schematic - Control Logic	430349
PC Board Assembly - Control Logic	402502*
Schematic - Control Logic	430686*
PC Board Assembly - Reference and Buffer Amplifier	400840
Schematic - Reference and Buffer Amplifier	430350
Rear Panel Assembly - 5400	400684
PC Board Assembly - Power Supply - 5400	400707
Schematic - Power Supply - 5400	430318
Wiring Diagram - Rear Panel - 5400-1	430613
Power Supply Assembly - 5403	402000
PC Board Assembly - Power Supply - 5403	402316
Assembly - Capacitor - 5403	402019
Schematic - Power Supply - 5403	430571
Wiring Diagram - Enclosure, 5400-1	430400

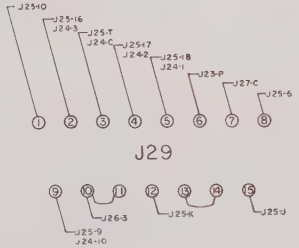
*Used on later production runs

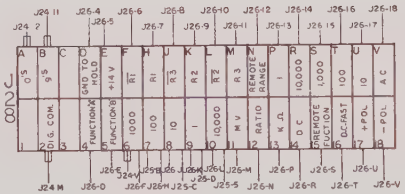
6.2 PARTS LISTS

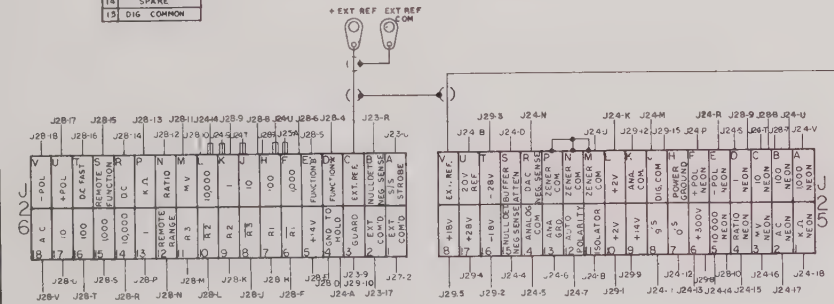
Parts Lists follow the drawings in the same sequence in which the drawings are listed.

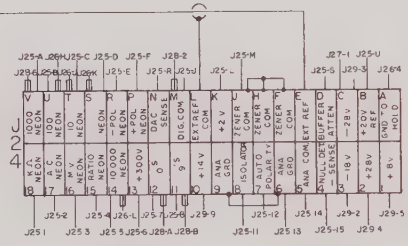

REF INPUT J205
J28
J26
J27
J25
J24
J23
J29 PIN FUNCTIONS
PIN FUNCTION
1 ±18V SENSE COM
2 DIGITAL COMMON
3 +14V
4 ANALOG COMMON
5 +18V
6 +28V
7 -18V
8 -28V
9 +300V
LEADS INDICATED THUS: CONSIST PARTIALLY OF 22 GA. TINNED BUS WIRE (P/N S90004) INSULATED WITH 20 GA. TEFLON SLEEVING (P/N S91376).
CONNECTORS SHOWN AS VIEWED FROM REAR OF INSTRUMENT. THUS J23, J24, J25 AND J26 ARE ON FAR SIDE OF INTERCONNECTION BOARD, J27, J28 AND J29 ARE ON NEAR SIDE.
LIST OF MATERIAL OR PARTS LIST
DANA LABORATORIES INC.
IRVINE, CALIFORNIA
WIRING DIAGRAM
INTERCONNECTION
DR W.EDIE 10-24-65
CHK T.OFT 11-10-65
APPD J.NELSON 11-10-65
SIZE E
CODE IDENT NO 21703
DWG NO 45031
REV K

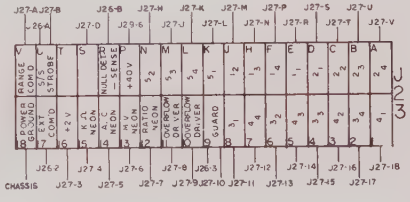
J29 PIN FUNCTIONS	
PIN	FUNCTION
1	+2 V
2	−18 V
3	−28 V
4	+26 V
5	+18 V
6	+40 V
7	+14V ISOLATED
8	+300 V
9	+14 V
10	GUARD
11	GUARD
12	ANA. COMMON
13	SPARE
14	SPARE
15	DIG COMMON











2. LEADS INDICATED THUS: CONSIST PARTIALLY OF 22 GA TINNED BUSS WIRE (P/N 500004) INSULATED WITH 20 GA TEFLON SLEEVING (P/N 901376).

1. CONNECTORS SHOWN AS VIEWED FROM REAR OF INSTRUMENT: THUS J 23, J 24, J 26 AND J 26 ARE ON FAR SIDE OF INTERCONNECTION BOARD; J 27, J 28 AND J 29 ARE ON NEAR SIDE.

NOTES: UNLESS OTHERWISE SPECIFIED

QTY REQD	SYM	ITEM NO.	GOVT OR VENDOR NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION

LIST OF MATERIAL OR PARTS LIST

NEXT ASSY	USED ON	NA	FA
702001	5th 3,5200	REF	REF
APPLICATION		QTY REQD	

MATERIAL

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS: X ± .030, XX ± .020, XXX ± .010
ANGLES ± 0° 30'
FORMED ANGLES ± 1.0°
ECCENTRICITY BETWEEN DIA ON THE SAME AXIS SHALL NOT EXCEED .010 TIR.
INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS MIL-D-1000 AND MIL-D-70327

PLIED FINISH

HEAT TREATMENT

CONTRACT NO.

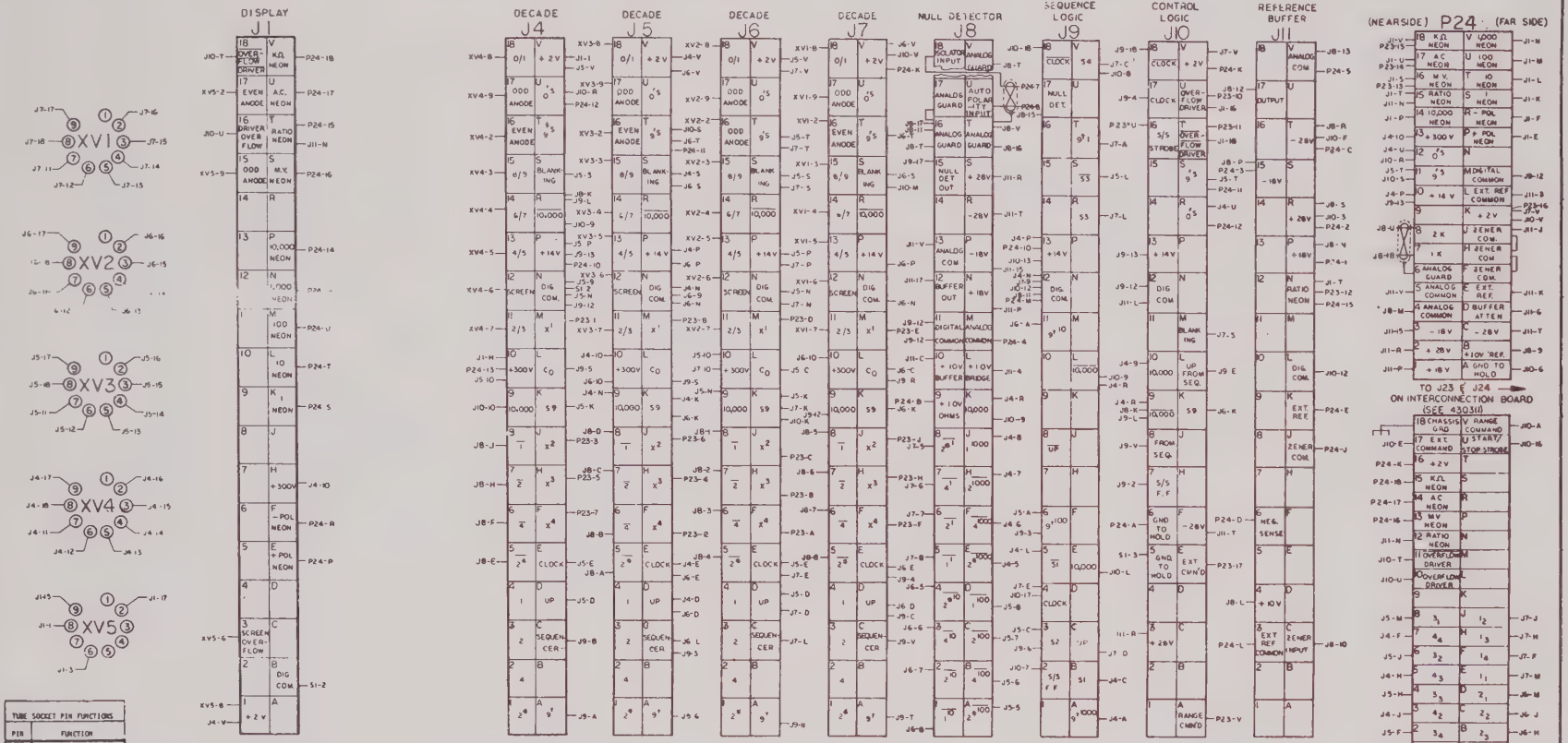
	NAME	DATE
DR	A. CHAUSSEE	4-21-65
CHK	[illegible]	4/26/65
APPD		

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

WIRING DIAGRAM - INTERCONNECTION.

SIZE	CODE IDENT NO.	DWG NO.
D		430397

SCALE —— WT —— SHEET 1 OF 1



TUBE SOCKET PIN FUNCTIONS	
PIN	FUNCTION
1	Not used
2	Even anode
3	8 - 9
4	6 - 7
5	4 - 5
6	Screen
7	2 - 3
8	0 - 1
9	Odd anode

1. CONNECTORS VIEWED FROM BOTTOM OF INSTRUMENT (DIP PIN SIDE).

NOTES: UNLESS OTHERWISE SPECIFIED

QTY REQD	SYM	ITEM NO.	GOVT OR VENDOR NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION

LIST OF MATERIAL OR PARTS LIST

MATERIAL

APPLIED FINISH

HEAT TREATMENT

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON DECIMALS: X ± .030, XX ± .020, XXX ± .010; ANGLES ± 0° 30'
FORMED ANGLES ± 1.0°
ECCENTRICITY BETWEEN DIA ON THE SAME AXIS SHALL NOT EXCEED .010 TIR.
INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS MIL-D-1000 AND MIL-D-70327

CONTRACT NO.

	NAME	DATE
DR	W. E. Oke	3-3-64
CHK	M. Carlson	3/17/64
APPD	J. Nelson	3/17/64

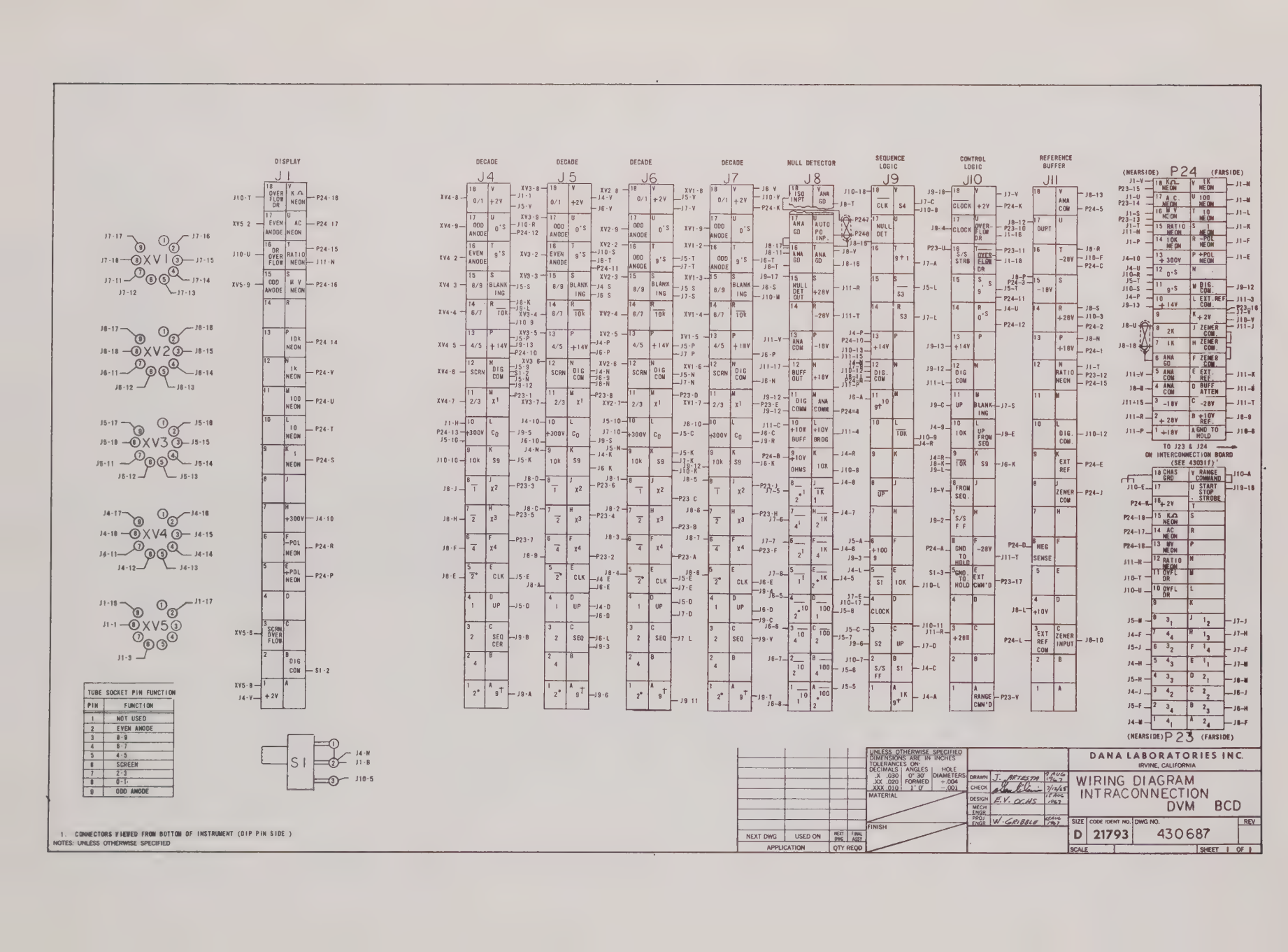
R-2 6-10-66
FRN 6198

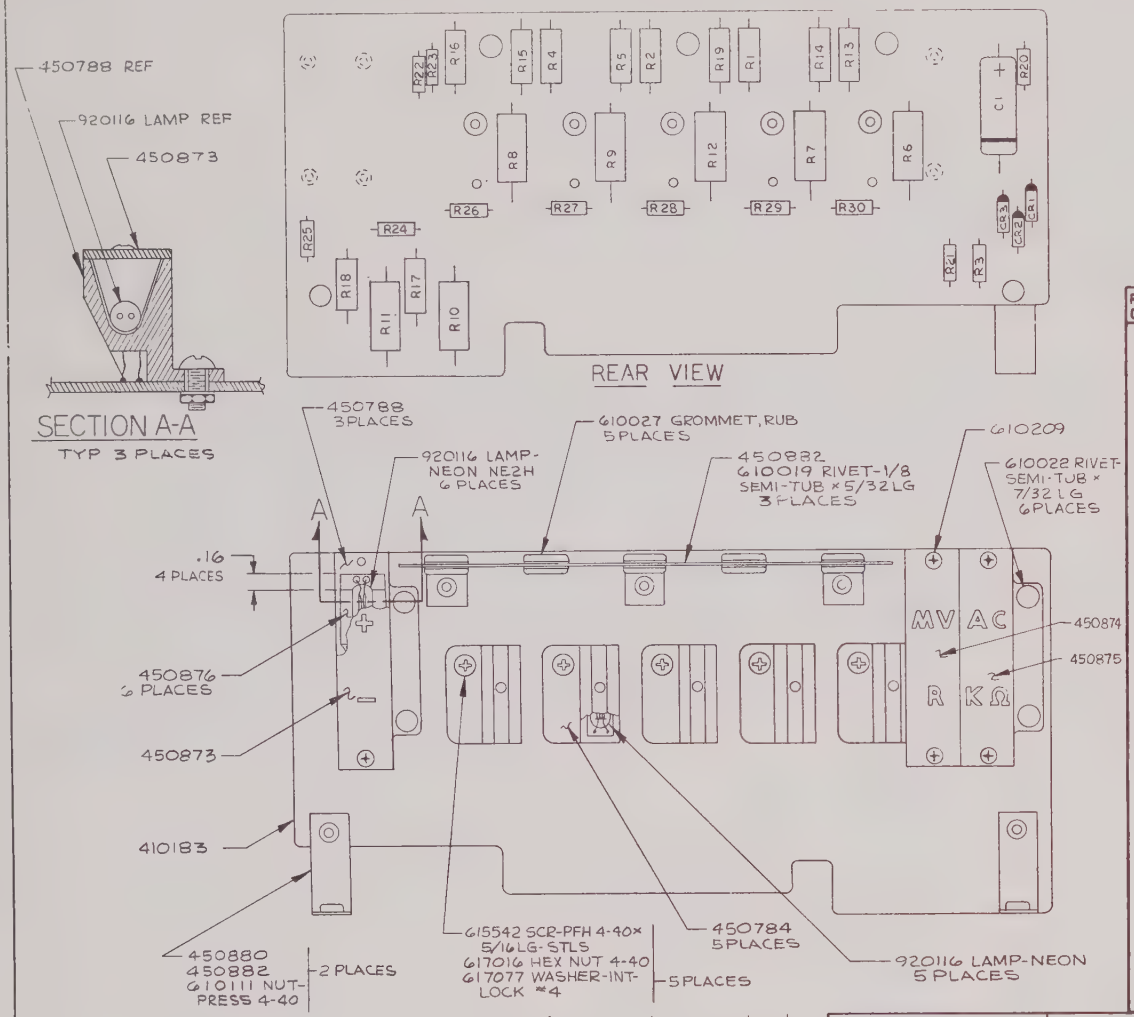
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

WIRING DIAGRAM - INTRACONNECTION, 5400 DVM, BCD

SIZE	CODE IDENT NO.	DWG NO.	
D	—	430362	A

SCALE — WT — SHEET 1 OF 1


DISPLAY
J1
DECADE
J4
DECADE
J5
DECADE
J6
DECADE
J7
NULL DETECTOR
J8
SEQUENCE LOGIC
J9
CONTROL LOGIC
J10
REFERENCE BUFFER
J11
XV1
XV2
XV3
XV4
XV5
S1
(NEARSIDE) P24 (FARSIDE)
(NEARSIDE) P23 (FARSIDE)
TO J23 & J24 ON INTERCONNECTION BOARD (SEE 43031f)
TUBE SOCKET PIN FUNCTION
PIN 1 NOT USED
PIN 2 EVEN ANODE
PIN 3 8-9
PIN 4 6-7
PIN 5 4-5
PIN 6 SCREEN
PIN 7 2-3
PIN 8 0-1
PIN 9 ODD ANODE
1. CONNECTORS VIEWED FROM BOTTOM OF INSTRUMENT (DIP PIN SIDE)
NOTES: UNLESS OTHERWISE SPECIFIED
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON: DECIMALS .X .030 .XX .020 .XXX .010
ANGLES 0° 30' FORMED 1° 0'
HOLE DIAMETERS +.004 -.001
MATERIAL
FINISH
NEXT DWG
USED ON
APPLICATION
NEXT DWG
FINAL ASSY
QTY REQD
DRAWN J. ARTESTA 19 AUG 1965
CHECK 9/24/65
DESIGN E.V. OCHS 17 AUG 1965
MECH ENGR
PROJ ENGR W. GRIBBLE 1966
DANA LABORATORIES INC.
IRVINE, CALIFORNIA
WIRING DIAGRAM
INTRACONNECTION
DVM BCD
SIZE D
CODE IDENT NO. 21793
DWG NO. 430687
REV
SCALE
SHEET 1 OF 1



REF DES OR ITEM	P/N	DESCRIPTION	QTY
C1	110041	250UF, 6V	1
CR1	210004	SD4	3
↓	↓	↓	↓
CR3	210004	SD4	REF
R1	001107	39k, 1W	2
R2	001898	20k, 1W	2
R3	000224	220k, 1/4W	1
R4	001107	39k, 1W	REF
R5	001898	20k, 1W	REF
R6	030005	100k, 2W	7
↓	↓	↓	↓
R12	030005	100k, 2W	REF
R13	030012	130k, 1W	7
↓	↓	↓	↓
R19	030012	130k, 1W	REF
R20	000914	910k, 1/4W	11
↓	↓	↓	↓
R30	000914	910k, 1/4W	REF
	410183	PCB-DISPLAY	1
	450784	HOUSING-RANGE INDICATOR	5
	450788	HOUSING-FUNCTION READOUT	3
	450873	DISPLAY SCREEN-POLARITY	1
	450874	DISPLAY SCREEN-R-MV	1

P/N	DESCRIPTION	QTY
450875	DISPLAY SCREEN AC-K OHM	1
450876	REFLECTOR, FUNCT LAMP	6
450880	BRACKET-MTG, DISPLAY CARD	2
450882	BRACKET-READOUT TUBE RETAINER	1
610019	RIVET-1/8 SEMI-TUB X 5/32 LG	5
610022	RIVET-SEMI-TUB X 7/32 LG	6
610027	GROMMET-RUB, BL	5
610111	NUT-PRESS, 4-40	2
610209	SCREW-PPH 2-56 X 3/16 LG SELFTAP	6
615542	SCREW-PFH 4-40 X 5-16 LG STLS	5
617016	HEX NUT 4-40 RADIO, STLS	5
617077	WASHER-INT LOCK #4 STLS	5
920116	LAMP-NEON NE2H	11

3. SCHEMATIC REFERENCE : 430301
2. ASSEMBLY PROCEDURES & PROCESSES TO CONFORM TO DANA WORKMANSHIP STANDARDS.
1. INDICATOR TUBE ON P/N 450784 (5 PLACES) AND P/N'S 450873, 450874, 450875 TO BE MASKED BEFORE HUMI-SEAL.

NOTES: UNLESS OTHERWISE SPECIFIED

NEXT DWG	USED ON	NEXT DWG	FINAL ASSY
APPLICATION		QTY REQD	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON:

DECIMALS	ANGLES	HOLE DIAMETERS
.X .030	0 30'	.004
.XX .020	FORMED	
.XXX .010	1 0'	.001

MATERIAL

FINISH

DRAWN	T. WRYE	11/9/65
CHECK	W. TOFT	11/17/65
DESIGN	J. BRUCE	
MECH ENGR		
PROJ ENGR		

DRN 207

11/19/65 SAM

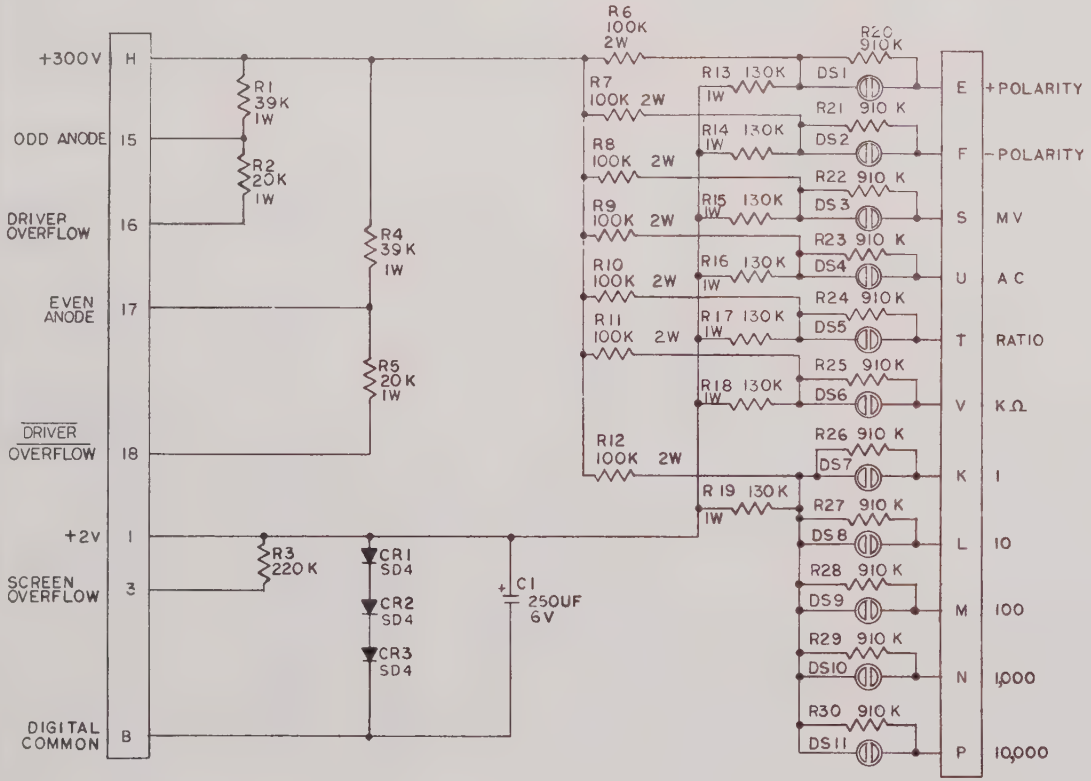
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

P. C. BOARD ASSY — DISPLAY

SIZE	CODE IDENT NO	DWG NO.	REV
C	21793	400691	M

SCALE NONE

SHEET 1 OF 1



3 HIGHEST REFERENCE DESIGNATORS ARE:
R30
DS11
CR4
C1

2. ALL NEON LAMPS ARE NE-2H
1. ALL RESISTORS 1/4W, 5%, CARBON
NOTES: UNLESS OTHERWISE SPECIFIED

400691	754 COUPLER	REF	REF
400691	HARDY SCALES	REF	REF
400691	5503 SER DVM	REF	REF
400691	5400 SER DVM	REF	REF
NEXT ASSY	USED ON	NEXT ASSY	FINAL ASSY
APPLICATION		QTY REQD	

SYMBOLS
APPLICABLE TO DANA LABORATORIES INC. ONLY
SA.....SUB—ASSY MRA....MAJOR REPL ASSY
MA.....MODULE ASSY CA.....COMPLETE ASSY

QTY REQD	SYM	ITEM NO.	GOV'T IDENT NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	SPECIFICATION

LIST OF MATERIALS OR PARTS LIST

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS: X ± .030, XX ± .020, XXX ± .010
ANGLES ± 0° 30'

MATERIAL

APPLIED FINISH

DRAWN 10-18-65
CHECK 19 OCT 65
ENGR 1 NOV 65
APPR

APPROVED

APPROVED 11-17-65

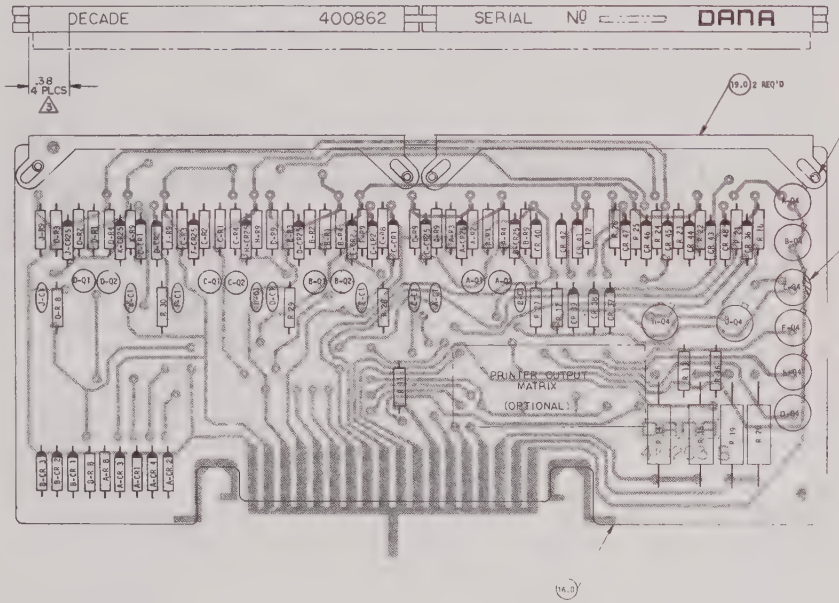
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC — DISPLAY

CODE IDENT NO. | SIZE C | 430301 | F

SCALE | WEIGHT | SHEET 1 OF 1

F | 430301



REF DES	B/M ITEM	DESCRIPTION
R 2	3.0	15 K
D-R3	5.0	2.7 K
D-R1		
F-R3		
F-P1		
B-P3		
B-R1	5.0	2.2 K
A-P3	2.0	1.2 K
A-R1	2.0	1.2 K
Q 4	13.0	Q14
D 7	14.0	2N3646
[illegible]	14.0	2N3646
[illegible]	15.0	1N662
THRU		
CR36	15.0	1N662
CR25	15.0	1N662
[illegible]	15.0	1N662
[illegible]	15.0	1N662
CR 2	15.0	1N662
CR 1	15.0	1N662
[illegible]	12.0	3? pf

REF DES	B/M ITEM	DESCRIPTION
R 30	6.0	22 K
THRU		
R 27	6.0	22 K
R 26	9.0	33 K
THRU		
R 21	9.0	33 K
[illegible]	11.0	20 K, 1W
R 19	10.0	39 K,
R 18	1.0	10 K
R 17	1.0	10 K
R 16	1.0	10 K
R 15	10.0	39 K, 1W
R 14	11.0	20 K, 1W
R 13	1.0	10 K
R 12	1.0	10 K
R 11	[illegible]	200 K
R 9	8.0	27
R [illegible]	7.0	24 K
R 4	3.0	15 K

ITEM NO.	PART NO.
16.0	410203 B
15.6	610735
20.0	610737
21.0	920006

QTY REQD	SYM	ITEM NO.	GOV'T OR VENDOR NO	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION

LIST OF MATERIAL OR PARTS LIST

MATERIAL

APPLIED FINISH

HEAT TREATMENT

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON DECIMALS: X ± .030, XX ± .020, XXX ± .010; ANGLES ± 0° 30'
FORMED ANGLES ± 1.0°
ECCENTRICITY BETWEEN DIA ON THE SAME AXIS SHALL NOT EXCEED .010 TIR.
INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS MIL D-1000 AND MIL D-70327

CONTRACT NO.

	NAME	DATE
DR	[illegible]	28 JAN 1966
CHK	[illegible]	29 JAN 1966
APPD	[illegible]	

Rel 6-10 [illegible]
DRN 41638

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

P.C. BOARD ASS'Y-
DECADE, BCD, BASIC

SIZE	CODE IDENT NO.	DWG NO.	
D	—	400862	B

SCALE 2/1 WT — SHEET / OF /

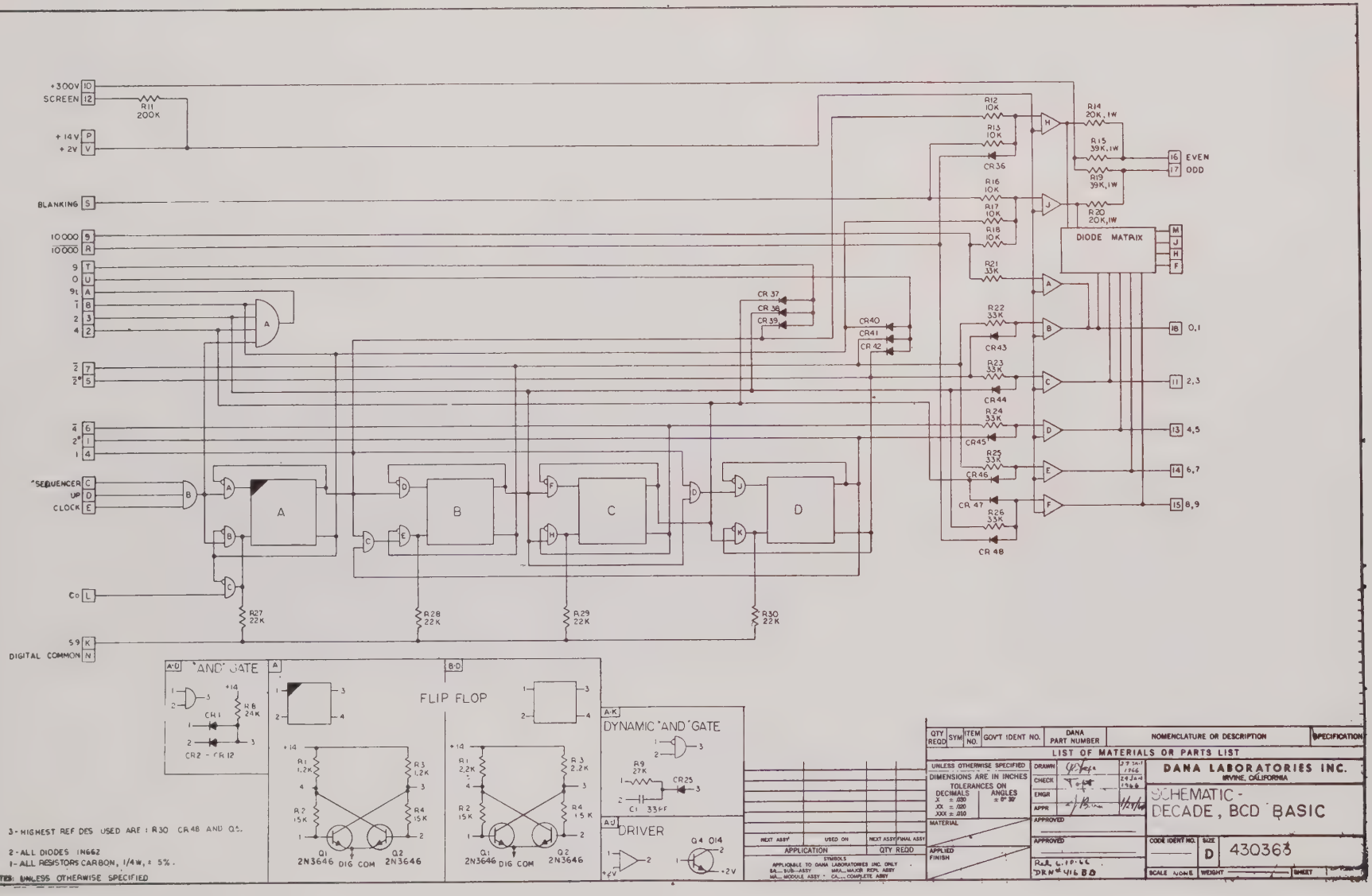
4. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS

3. Heat stamp .10 high black characters and .15 high logo, located as shown.

2. Diodes to be 1N662

1. Resistors to be 1/4W, ± 5%, Carbon

NOTES: UNLESS OTHERWISE SPECIFIED



3 - HIGHEST REF DES USED ARE : R30 CR48 AND Q5.

2 - ALL DIODES IN662

1 - ALL RESISTORS CARBON, 1/4W, ± 5%.

NOTES: UNLESS OTHERWISE SPECIFIED

QTY REQD	SYM	ITEM NO.	GOVT IDENT NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	SPECIFICATION

LIST OF MATERIALS OR PARTS LIST

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON DECIMALS X ± .030 XX ± .020 XXX ± .010
ANGLES ± 0° 30'

DRAWN — DATE 7-14-66
CHECK — DATE 24 Jan 1968
ENGR
APPR
MATERIAL
APPROVED
APPLIED FINISH
APPROVED
DRN # 41680

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

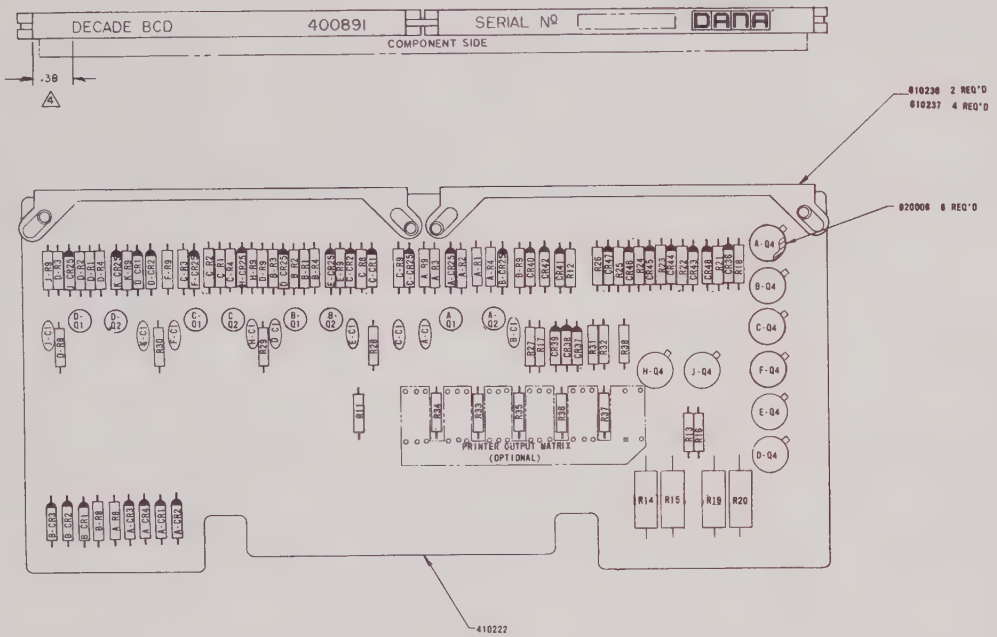
SCHEMATIC - DECADE, BCD BASIC

CODE IDENT NO. | SIZE D | 430363

SCALE NONE | WEIGHT | SHEET

NEXT ASSY	USED ON	NEXT ASSY FINAL ASSY
APPLICATION		QTY REQD

SYMBOLS
APPLICABLE TO DANA LABORATORIES INC. ONLY
SA — SUB-ASSY MA — MAJOR REPL. ASSY
MA — MODULE ASSY CA — COMPLETE ASSY



REF DES	PART NO.	DESCRIPTION	
R16	000103	10 K	REF
R15	001107	39 K, 1 W	2
R14	001698	20 K, 1 W	2
R13	000103	10 K	REF
R12	000103	10 K	11
R11	000204	200 K	2
R9	000273	27 K	9
R8	000243	24 K	4
R4	000153	15 K	REF
R3	000122	1.2 K	REF
R2	000153	15 K	8
R1	000122	1.2 K	8
Q4	200079	021	8
Q2	200037	2N3646	REF
Q1	200037	2N3646	8
CR48	211083	018	REF
THRU			
CR38	211083	018	REF
CR25	211083	018	REF
CR4			
CR3			
CR2			
CR1	211083	018	33
E-C1	100005	22PF DISC	1
C1	101102	47 PF DISC	8

REF DES	PART NO.	DESCRIPTION	
R38	000204	200 K	REF
R37	000473	47 K	REF
THRU			
R33	000473	47 K	5
R32	000563	56 K	1
R31	000883	88 K	1
R30	000223	22 K	REF
THRU			
R27	000223	22 K	4
R26	000103	10 K	REF
THRU			
R21	000103	10 K	REF
R20	001698	20 K, 1 W	REF
R19	001107	39 K, 1 W	REF
R18	000103	10 K	REF
R17	000103	10 K	REF

NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	
402269	5500 BASIC	1	5
	5400 BASIC	1	4
402357	MOD 61, P2	1	4
	73-E2, 75-E2	1	5
	63-E2, 65-E2	1	4
402342	MOD 61-P1	1	4
	73-E1, 75-E1	1	5
	63-E1, 65-E1	1	4
402343	MOD 61, M2	1	4
	73-D2, 75-D2	1	5
	63-D2, 65-D2	1	4
402162	MOD 61, M1	1	4
	73-D1, 75-D1	1	5
	63-D1, 65-D1	1	4

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON:
DECIMALS: X .030, XX .020, XXX .010
ANGLES 0° 30'
FORMED ANGLES 1.0
MATERIAL
FINISH
CONTRACT NO.
DRAWN ABBOTT 1/1/67
CHECK 1/16/67
COG. ENGR
PROJ. ENGR 1/16/67
DENIED 5-8-67

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

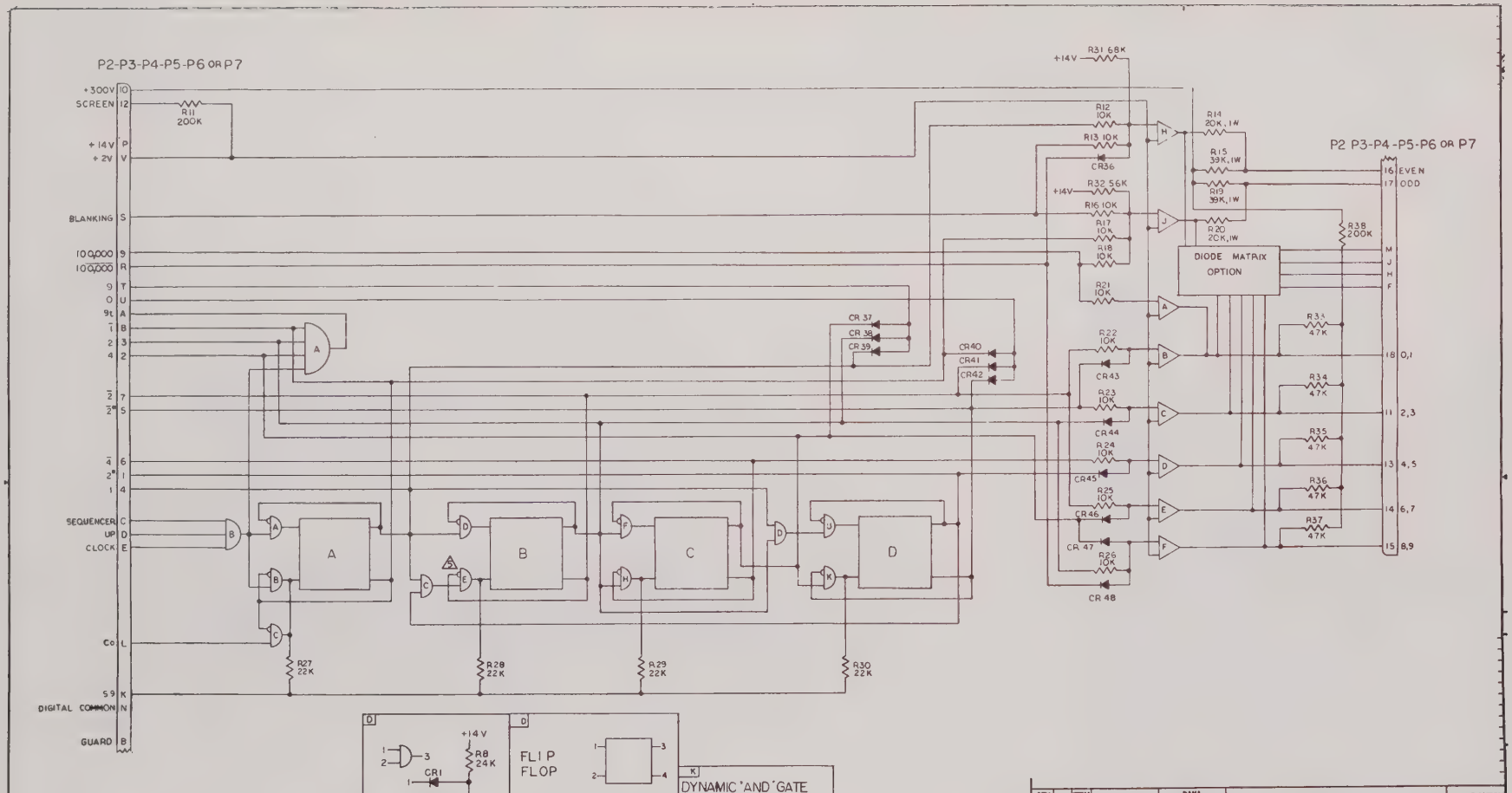
PC BOARD ASSY — DECADE, BASIC

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	400891	H

SCALE 2/1 WT SHEET 1 OF 1

4. HEAT STAMP .10 HIGH BLACK CHARACTERS AND .15 HIGH LOGO LOCATED AS SHOWN.
3. SCHEMATIC REFERENCE: 430390.
2. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS
1. ALL RESISTORS ARE 1/4 W, ± 5%, CARBON.

NOTE: UNLESS OTHERWISE SPECIFIED



CAPACITOR E-C1 IS 22 PF

4 - REF. DESIG. NOT USED: CR3-24 26-35, Q3, R5,6,7,10

3 - HIGHEST REF DES USED ARE: R38 CR48 AND Q4

2 - ALL DIODES D18

1 - ALL RESISTORS CARBON, 1/4W, ± 5%.

NOTES: UNLESS OTHERWISE SPECIFIED

	73,74,75	REF	REF
	61,63,64,65	REF	REF
400891	5300 BASIC	REF	REF
	5400 BASIC	REF	REF

NEXT ASSY	USED ON	NEXT ASSY	FINAL ASSY
APPLICATION		QTY REQD	

BREAKOUT
APPLICABLE TO DANA LABORATORIES INC. ONLY
BA—BUB—ASSY MRA—MAJOR REPL ASSY
MA—MODULE ASSY CA—COMPLETE ASSY

QTY REQD	SYM	ITEM NO.	GOV'T IDENT NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	SPECIFICATION

LIST OF MATERIALS OR PARTS LIST

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON DECIMALS .X ± .030 .XX ± .010 .XXX ± .010 ANGLES ± 0° 30'

MATERIAL

APPLIED FINISH

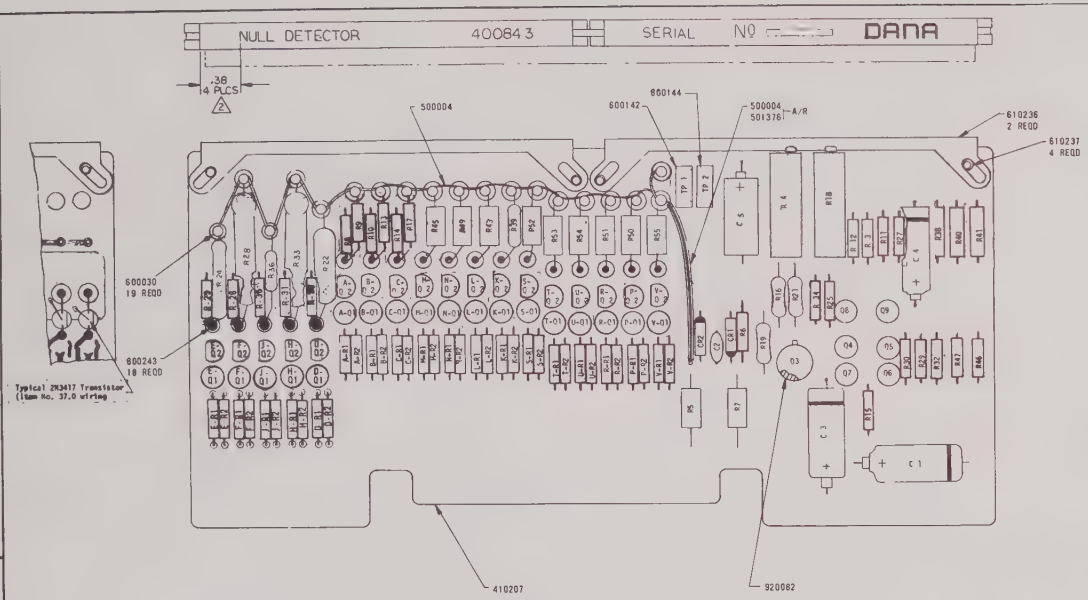
DRAWN — 28 APR 1966
CHECK — 9 MAY 1966
ENGR — 5/4/67
APPR — 5/5/67
APPROVED
APPROVED
APPROVED 5-5-67

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC - DECADE, BCD BASIC

CODE IDENT NO. 21793 | SIZE D | 430380 | 0

SCALE — | WEIGHT — | SHEET 1 of 1



REF DES OR ITEM	P/N	DESCRIPTION	QTY
H	200055	LOW ORDER DAC YEL	REF
J	200055	LOW ORDER DAC YEL	REF
Q3	200036	015	2
Q4	200043	2N3565	6
Q5			REF
Q6			
Q7			
Q8			
Q9	200043	2N3565	REF
R1	000473	47k	18
R2	000333	33k	18
R3	000204	200k	1
R4	040050	5k POT	1
R5	020193	4840.22 .01%	1
R6	000084	680k	1
R7	020184	2400.00 .01%	1
R8	000104	100k	6
R9	000516	51MEG	1
R10	000104	100k	REF
R11	000133	13k	1
R12	000432	4.3k	1
R13	000248	24 MEG	2
R14	000104	100k	REF
R15	000331	330	1

REF DES OR ITEM	P/N	DESCRIPTION	QTY
C1	110036	25UF/50V	2
C2	101175	220pF DISC	1
C3	110036	25UF/50V	REF
C4	110040	1UF/50V	1
C5	110002	22UF/35V 20%	1
CR1	211083	018	2
CR2	211083	018	REF
Q1	200037	2N3646	18
Q2	200054	HI ORDER DAC WHT	10
K			
L			
M			
N			
P			
R			
S			
T			
U			
V	200054	HI ORDER DAC WHT	REF
Q2	200055	LOW ORDER DAC YEL	8
A			REF
B			
C			
D			
E			
F	200055	LOW ORDER DAC YEL	REF

REF DES OR ITEM	P/N	DESCRIPTION	QTY
R16	010113	15k RN60B	2
R17	000246	24 MEG	REF
R18	040048	2k POT	1
R19	010272	154k 1%	1
R20	000104	100k	REF
R21	010113	15k RN60B	REF
R22	010270	12.5k 1%	1
R23	000104	100k	REF
R24	010248	5 MEG 1%	1
R25	000334	330k	2
R26	000104	100k	REF
R27	000183	12k	2
R28	010288	2.5MEG .25%	2
R29	000242	2.4k	1
R30	000123	11k	1
R31	000104	100k	REF
R32	000103	12k	REF
R33	010280	2.5MEG .25%	REF
R34	000334	330k	REF
R35	000104	100k	REF
R36	010287	1.25MEG 1%	1
R38	001892	4.7k 1/2W	2
R39	010267	500k 1%	1
R40	001703	8.2k 1/2W	1
R41	001892	4.7k 1/2W	REF
R43	020198	250k J11	2

REF DES OR ITEM	P/N	DESCRIPTION	QTY
R45	020198	250k J11	REF
R46	000273	27k	1
R47	000124	120k	1
R48	020197	125k J11	1
R50	020185	48.985k .01%	2
R51	020188	24.995k .01%	4
R52			REF
R53			
R54	020198	24.995k .01%	REF
R56	020195	49.985k .01%	REF
		410207 PCB-NULL DET 4 DIGIT	1
		500004 WIRE-22GA BARE	A/R
		501376 TUBE-22GA TEFLON	A/R
		600030 TERM.-TEFLON	19
		600142 HORIZ JACK WHITE	1
		600144 HORIZ JACK BLACK	1
		600243 TERM.-FEEDTHRU	18
		610230 HANDLE-EXTRACTOR	2
		610237 PIN-SPRING	4
		920010 SOLDER-63/37 BAR	A/R
		920026 SLEEVE-WIRE	A/R
		1MMS-PAD	1

QTY REQD	SYM	ITEM NO.	GOV'T OR VENDOR NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION

LIST OF MATERIAL OR PARTS LIST

MATERIAL

APPLIED FINISH

HEAT TREATMENT

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON DECIMALS: X ±.030, XX ±.020, .XXX ±.010; ANGLES ±0°30'
FORMED ANGLES ±1.0°
ECCENTRICITY BETWEEN DIA ON THE SAME AXIS SHALL NOT EXCEED .010 TIR.
INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS MIL-D-1000 AND MIL-D-70327

CONTRACT NO.

	NAME	DATE
DR	[illegible]	1 Feb 66
CHK	[illegible]	10 Feb 1966
APPD	[illegible]	

Rel 6.18.66
DRN # 420 BB

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

PC BOARD ASSY -
NULL DETECTOR, 4 DIGIT

SIZE	CODE IDENT NO.	DWG NO.	
D	21793	400843	M

SCALE 2/1 WT SHEET 1 OF 1

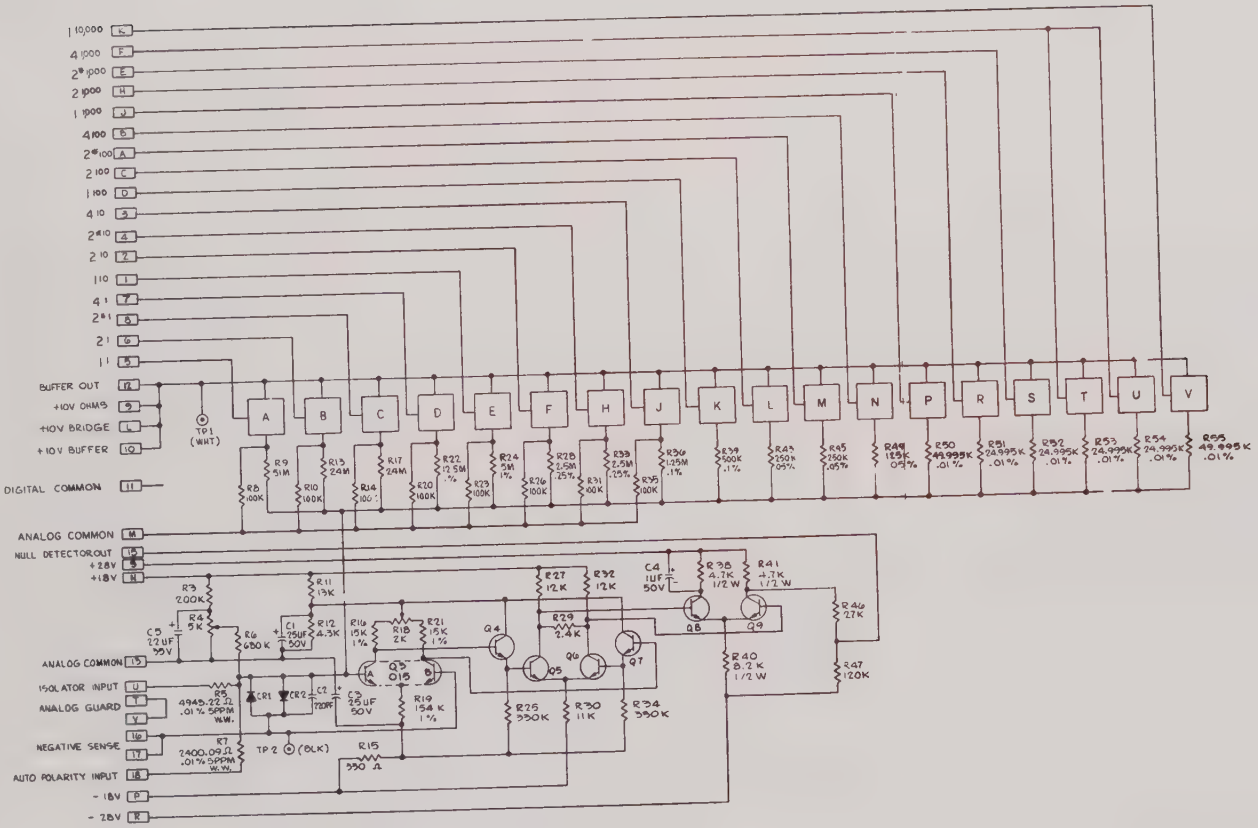
4 SCHEMATIC REFERENCE: 430351

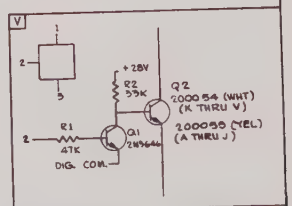
3. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS.

2 Heat Stamp .10 high black characters And .15 high Logo, Located as shown

1. All Resistors 1/4 W, 5%, Carbon

NOTES: UNLESS OTHERWISE SPECIFIED





SEQ NO.	SYM	ITEM NO.	GOVT OR VENDOR NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION

LIST OF MATERIAL OR PARTS LIST

MATERIAL	UNLESS OTHERWISE SPECIFIED	CONTRACT NO.
APPLIED FINISH	DIMENSIONS ARE IN INCHES. TOLERANCES ON DECIMALS: .X ± .060, .XX ± .020, .XXX ± .010. ANGLES ± 0° 30'. ROUNDED ANGLES ± 1.0°	NAME / DATE: DR A. CHAVEZ 6-10-66; CHK M. CORREA 6-10-66; APPD J. BEAN 6-10-66
HEAT TREATMENT	ROOTMOTORY BETWEEN DIA ON THE SHAFT AND SHALL NOT EXCEED .000 TIR. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS MIL-D-1000 AND MIL-R-70827	REL 6-10-66 DWN 420 SB

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC — NULL DETECTOR, 4 DIGIT

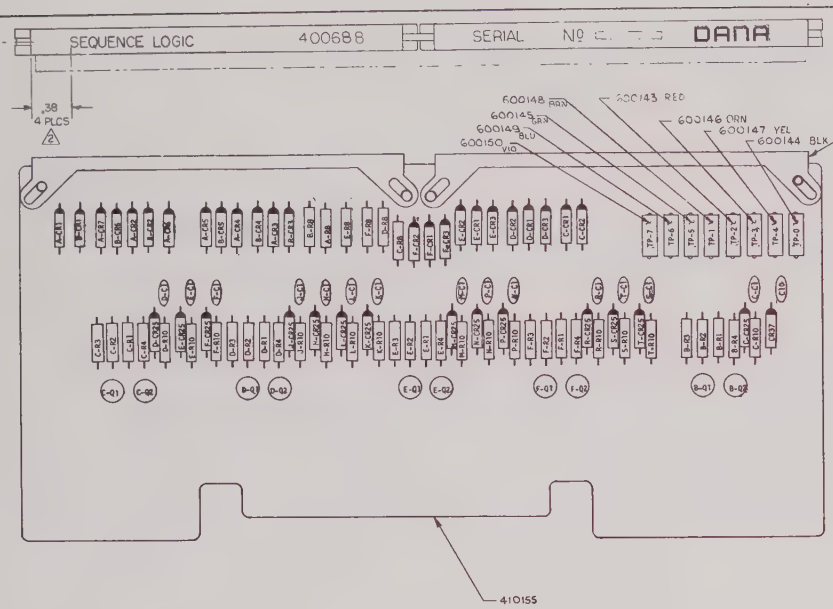
SIZE E | CODE IDENT NO. 21793 | DWG NO. 430351 | B

SCALE — | WT — | SHEET 1 OF 1

400843 5400 REF REF

NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL DIODES ARE D18.
2. ALL RESISTORS ARE 1/4W, 5%, CARBON.
3. ALL TRANSISTORS ARE 2N965.
4. ALL VOLTAGES ARE REFERENCED TO ANALOG COMMON
5. HIGHEST REFERENCE DESIGNATOR
   C 5
   D 7



REF DES OR ITEM	P/N	DESCRIPTION	QTY	REF DES OR ITEM	P/N	DESCRIPTION	QTY
C1	100012	33pF DISC	14		430348	SCHEMATIC-SEQUENCE LOGIC	A/R
C10	101175	220pF DISC	1		600143	HORIZ JACK RED	1
					600144	HORIZ JACK BLK	1
CR1	211083	018	38		600145	HORIZ JACK GREEN	1
↑	↑	↑	↑		600146	HORIZ JACK ORANGE	1
THRU					600147	HORIZ JACK YELLO	1
↓	↓	↓	↓		600149	HORIZ JACK BROWN	1
CR7	211083	018	REF		600149	HORIZ JACK BLUE	1
CR25	211083	018	REF		600150	HORIZ JACK VIOLE	1
CR37	211083	018	REF		610236	HANDLE-EXTRACTOR	2
					610237	PIN-SPRING	4
Q1	200037	2N3646	10		920010	SOLDER-BAR	A/R
Q2	200037	2N3646	REF				
R1	000222	2.2k 1/4W 5%	6				
R-R1	000822	8.2k 1/4W 5%	2				
R2	000153	15k 1 4W 5%	10				
R3	000222	2.2k 1/4W 5%	REF				
R-R3	000822	8.2k 1/4W 5%	REF				
R4	000153	15k 1 4W 5%	REF				
R9	000123	12k 1/4W 5%	6				
R10	000273	27k 1/4W 5%	14				

QTY REQD	SYM	ITEM NO.	GOV'T OR VENDOR NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION

LIST OF MATERIAL OR PARTS LIST

4. SCHEMATIC REFFERENCE 430348
3. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS.
2. HEAT STAMP .10 HIGH BLACK CHARACTERS AND .15 HIGH LOGO, LOCATED AS SHOWN.
1. ALL RESISTORS 1/4W, 5% CARBON.

NOTES: UNLESS OTHERWISE SPECIFIED

400678 5400 1 1

MATERIAL

APPLIED FINISH

HEAT TREATMENT

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS: X ± .030, XX ± .020, XXX ± .010
ANGLES: ± 0° 30'
FORMED ANGLES ± 2.0°
ECCENTRICITY BETWEEN DIA ON THE SAME AXIS SHALL NOT EXCEED .010 TIR.
INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS MIL-D-1000 AND Mil D-70327

CONTRACT NO.

NAME	DATE
DR	11-17
CHK	11-17
APPD	

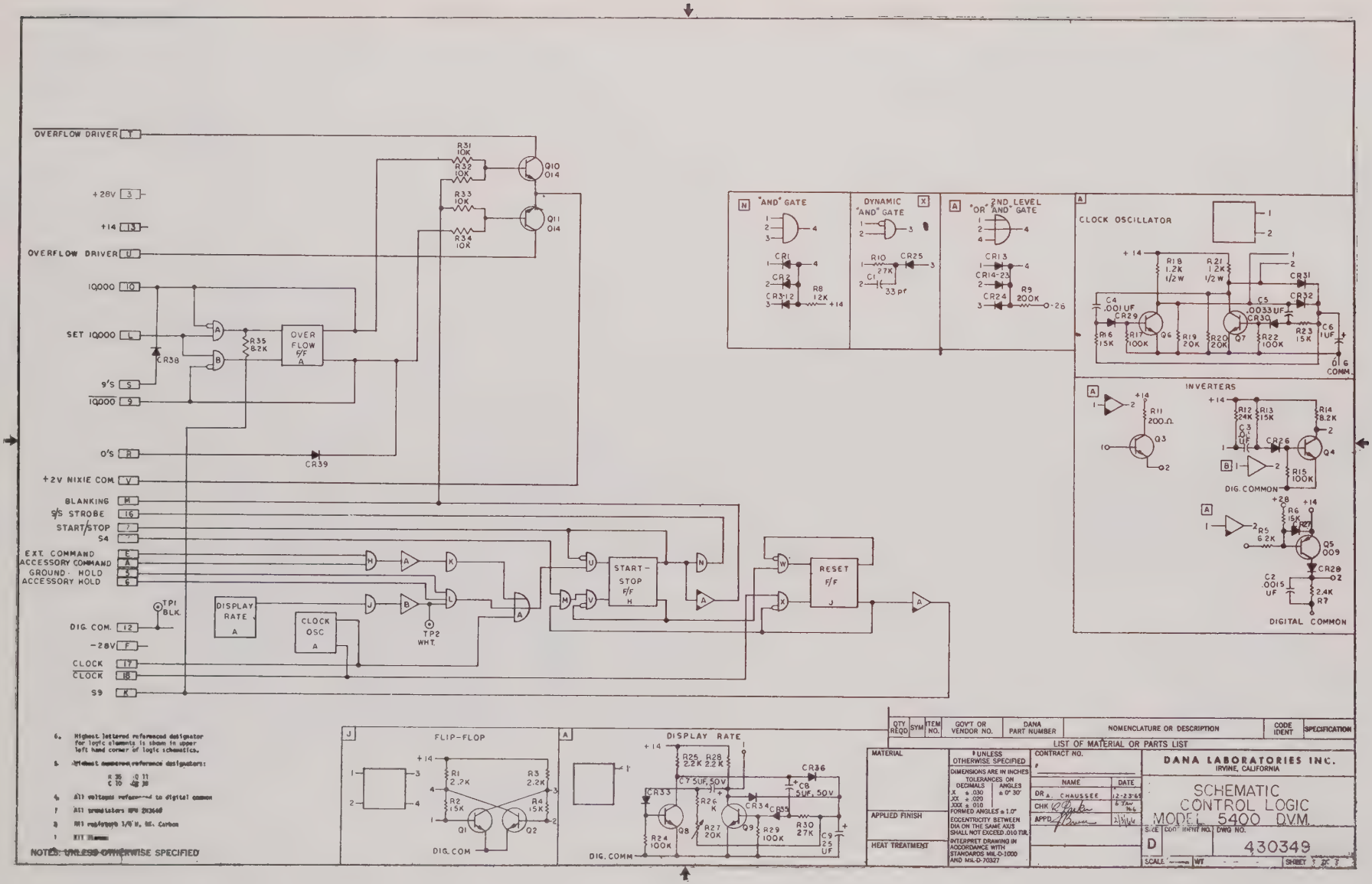
DRW # 3D1

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

PC BOARD ASS'Y
SEQUENCE LOGIC

SIZE	CODE IDENT NO.	DWG NO.	
D	21793	400688	E

SCALE 2:1 WT SHEET 1 OF 1



6. Highest lettered referenced designator for logic elements is shown in upper left hand corner of logic schematics.
5. Highest numbered reference designators:
   R 35 ; C 11
   C 10 ; CR 38
4. All voltages referenced to digital common
7. All transistors NPN 2N3646
8. All resistors 1/4 W, 5% Carbon
9. All Diodes

NOTES: UNLESS OTHERWISE SPECIFIED

QTY REQD	SYM	ITEM NO.	GOV'T OR VENDOR NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION

LIST OF MATERIAL OR PARTS LIST

MATERIAL

APPLIED FINISH

HEAT TREATMENT

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES
TOLERANCES ON DECIMALS: X ± .030, XX ± .020, XXX ± .010; ANGLES ± 0° 30'
FORMED ANGLES ± 1.0°
ECCENTRICITY BETWEEN DIA ON THE SAME AXIS SHALL NOT EXCEED .010 TIR.
INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS MIL-D-1000 AND MIL-D-70327

CONTRACT NO. #

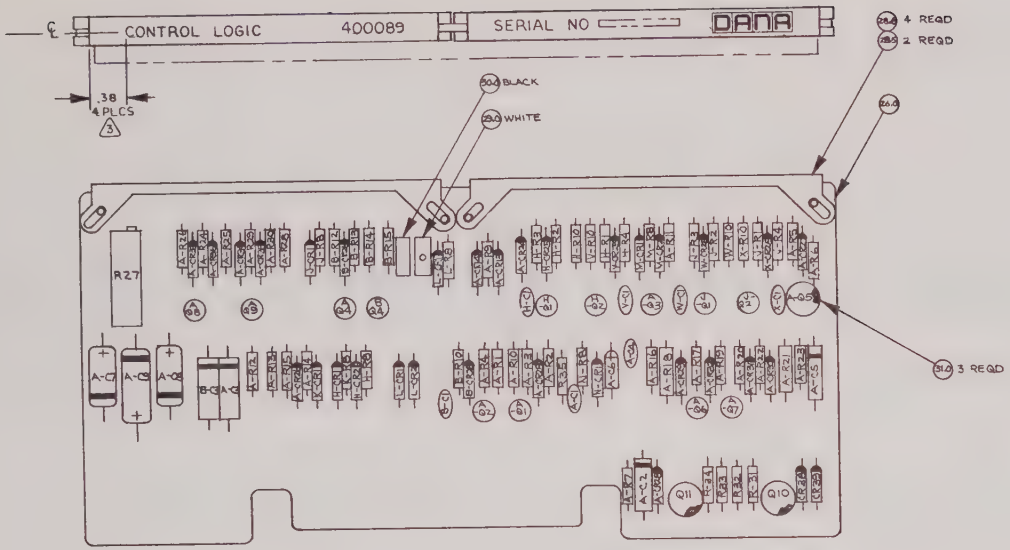
	NAME	DATE
DR	A. CHAUSSEE	12-23-65
CHK		6 JAN 66
APPD		2/3/66

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC CONTROL LOGIC MODEL 5400 DVM

SIZE D | CONT IDENT NO. | DWG NO. 430349

SCALE | WT | SHEET 1 OF 2



CROSS REFERENCE	
ITEM NO.	PART NO.
26.0	410156
29.5	610236
28.6	610237
25.0	600142
30.0	600184
31.0	620066

P1	8.0	2.2K		R35	13.0	8.2K	
				R34	1.0	10K	
				THRU			
Q11	23.0	014					
Q10	23.0	014		R31	1.0	10K	
Q9	24.0	2N3646		R30	11.0	2.7K	
				R29	2.0	100K	
THRU				R28	8.0	2.2K	
				R27	14.5	20K (POT)	
Q6	24.0	2N3646		R26	8.1	2.2K	
Q5	22.0	008		R25	8.0	2.2K	
Q4	24.0	2N3646		R24	2.0	100K	
				R23	5.0	15K	
THRU				R22	2.0	100K	
				R21	14.0	1.2K ½W 5%	
Q1	24.0	2N3646		R20	7.0	20K	
				R19	7.0	20K	
				R18	14.0	1.2K ½W 5%	
CR26	25.0	018		R17	2.0	100K	
				R16	5.0	15K	
THRU				R15	2.0	100K	
				R14	13.0	8.2K	
CR1	25.0	018		R13	5.0	15K	
				R12	10.0	24K	
				R11	6.0	200 OHM	
C9	18.0	25 MFD 25V		R10	11.0	2.7K	
C8	18.0	5.0 MFD 50V		R9	7.5	200K	
C7	18.0	5.0 MFD 50V		R8	13.0	8.2K	
C6	17.0	1 MFD 35V		R7	9.0	2.4K	
C5	19.5	.0033 MFD 100		R6	5.0	15K	
C4	16.5	.001 MFD DISC		R5	12.0	6.2K	
C3	21.3	015 MFD 100V		R4	5.0	15K	
C2	21.5	.0015 MFD 100		R3	8.0	2.2K	
C1	15.0	33 PF		R2	5.0	15K	
REF DES	BVM ITEM	DESCRIPTION		REF DES	BVM ITEM	DESCRIPTION	

△3 HEAT STAMP .10 HIGH BLACK CHARACTERS AND .15 HIGH LOGO LOCATED AS SHOWN.

2. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS.

1. ALL RESISTORS ARE ¼ W, ±5%, CARBON

NOTES: UNLESS OTHERWISE SPECIFIED

402184	400678	1	1
NEXT DWG	USED ON	NEXT DWG	FINAL ASSY
APPLICATION		QTY REQD	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON:

DECIMALS	ANGLES	HOLE DIAMETERS
.X .030	0° 30'	+.004
.XX .020	FORMED	-.001
.XXX .010	1 0°	

MATERIAL

FINISH

DRAWN	J. M. Edwards	8/8/68
CHECK	McCURDY	10/12/65
DESIGN		
MECH ENGR	JOE BRUCE	12/10/65
PROJ ENGR		

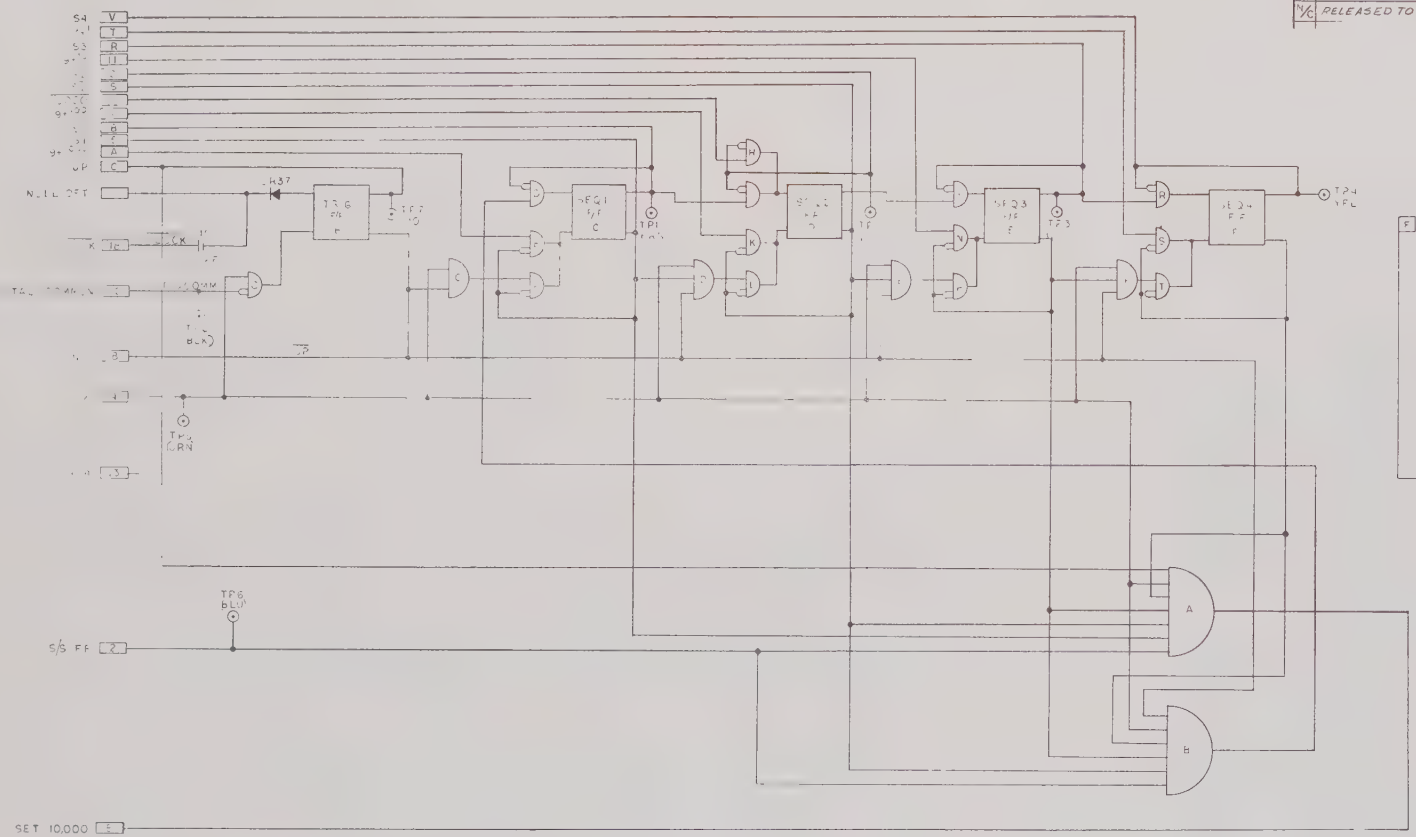
REL 11/17/65
DR. NO. 199

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

PC BOARD ASSY — CONTROL LOGIC

SIZE	CODE IDENT NO.	DWG NO.	REV
C	21793	400689	L

SCALE NONE SHEET 1 OF 1



REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	RELEASED TO PRODUCTION PILOT	18 FEB 66	

resistors ± 1 % 1 in ... are 0.2 Fm 1 4w, 5%, Carbon

b. ... lettered referenced ... for ... left and ... numeral ...

... P 35 ... 11 ... 20 14

4. All voltages referenced to digital common
3. All transistors NPN 2N3646
2. All resistors 1/4 ... , Carbon
1. All diodes IN 662

NOTES: UNLESS OTHERWISE SPECIFIED

QTY REQD	SYM	ITEM NO.	GOVT OR VENDOR NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION

LIST OF MATERIAL OR PARTS LIST

MATERIAL

APPLIED FINISH

HEAT TREATMENT

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON DECIMALS: .X ± .030, .XX ± .020, .XXX ± .010; ANGLES ± 0° 30'
FORMED ANGLES ± 1.0°
ECCENTRICITY BETWEEN DIA ON THE SAME AXIS SHALL NOT EXCEED .010 TIR.
INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS MIL-D 1000 AND MIL D-70327

CONTRACT NO.

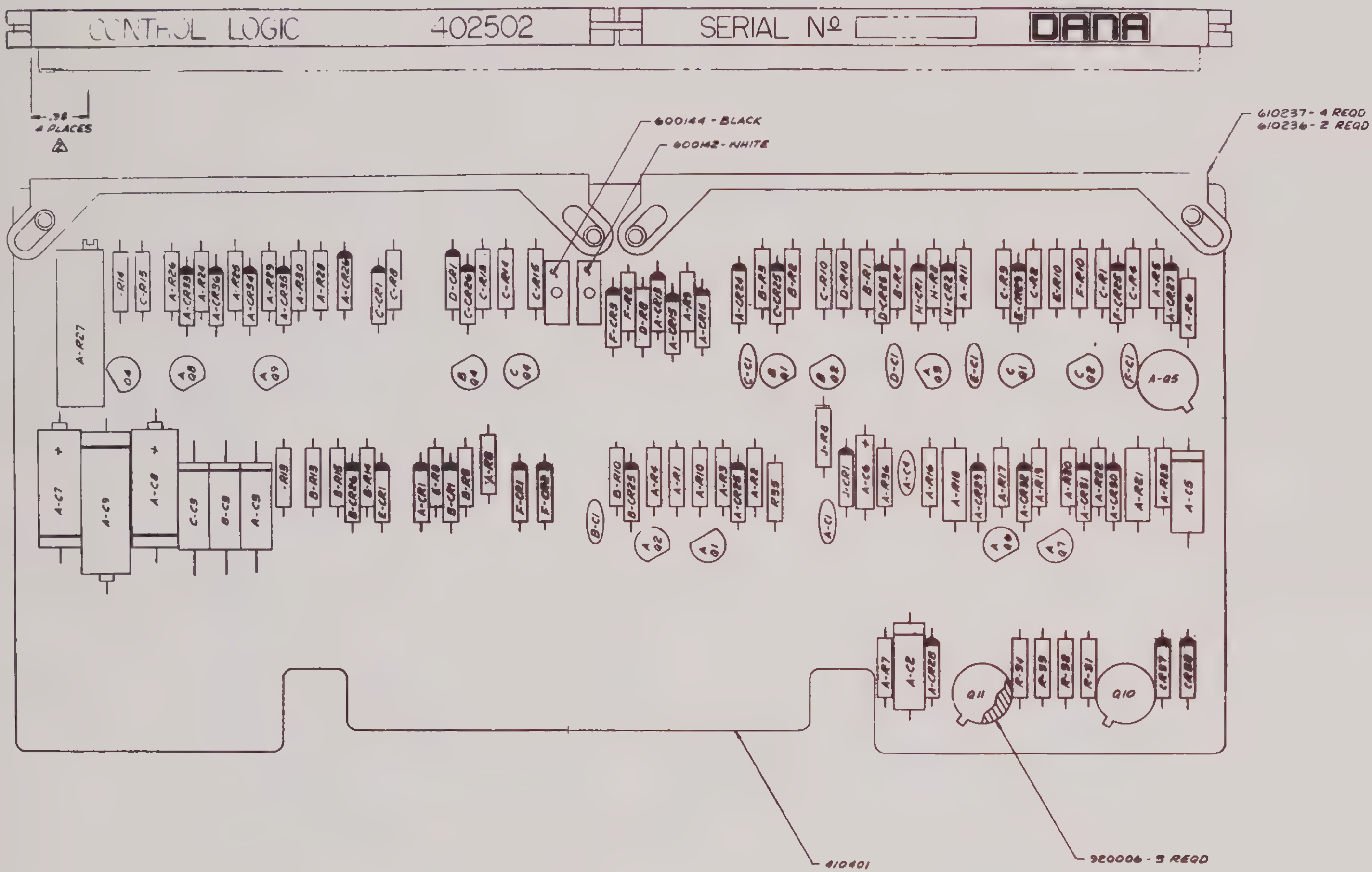
	NAME	DATE
DR		
CHK		
APPD		

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC — SEQUENCE LOGIC, MODEL 5400 DVM

SIZE	CODE IDENT NO.	DWG NO.
D		430348

SCALE — WT — SHEET 1 OF 1



REF DES OR ITEM	P/N	DESCRIPTION	QTY
C1	[illegible]012	33pf DISC	4
A-C1	101145	120 PF	2
B-C1	101145	100 PF	REF
C2	121473	[illegible]UF/100V	1
C3	[illegible]	[illegible]UF/100V	[illegible]
C4	101126	[illegible]UF DISC	1
C5	[illegible]	[illegible]UF/100V	1
C6	[illegible]	[illegible]UF/35V	1
C7	[illegible]	4.7UF/[illegible]	2
C8	[illegible]	4.7UF/[illegible]	REF
C9	[illegible]	[illegible]	1
CR1 THRU CR38	211083	018	[illegible]
Q1 THRU Q4	[illegible]	2N3646	4 / REF
Q5	[illegible]	019	1
Q6	[illegible]	2N3646	REF
Q9	[illegible]	2N3646	REF
Q10	[illegible]	021	2
Q11	[illegible]	021	REF
R3	[illegible]	2.2K	7
R4	[illegible]	15K	12
R5	[illegible]	4.2K	1
R6	[illegible]	15K	REF
R7	[illegible]	2.4K	1
R8	[illegible]	12K	8
J-R8	[illegible]	4.3K	1
R9	[illegible]	[illegible]	1
R10	[illegible]	27K	6
R11	[illegible]	[illegible]	1
R13	[illegible]	15K	REF
R14	[illegible]	8.2K	4
R15	[illegible]	[illegible]	7
R16	[illegible]	[illegible]	[illegible]
R17	[illegible]	[illegible]	[illegible]
R18	[illegible]	1.2K, [illegible]	2
R19	[illegible]	[illegible]	2
R20	[illegible]	[illegible]	[illegible]
R21	[illegible]	1.2K, [illegible]	[illegible]
R22	[illegible]	[illegible]	[illegible]
R23	[illegible]	15K	[illegible]
R24	[illegible]	[illegible]	[illegible]
R25	[illegible]	2.2 K	[illegible]
R26	[illegible]	[illegible]	6
R27	[illegible]	[illegible] POT	1
R28	[illegible]	2.2K	[illegible]
R29	[illegible]	[illegible]	[illegible]
R30	[illegible]	[illegible]	1
R31 THRU R33	[illegible]	[illegible]	4
R34	[illegible]	[illegible]	REF
R35	[illegible]	8.2K	REF
	[illegible]	PCB CONTROL LOGIC	1
	[illegible]	SCHEMATIC CONTROL LOGIC	[illegible]
	[illegible]	HANDLE-[illegible]	2
	[illegible]	PIN-[illegible]	4
	[illegible]	HORIZ-JACK-WHITE	1
	[illegible]	HORIZ-JACK-BLACK	1
	[illegible]	TRANS PAD-LARGE	3
	[illegible]	SOLDER-[illegible]	A/R

LIST OF MATERIAL OR PARTS LIST

DANA LABORATORIES INC.

PC BOARD ASSY-
CONTROL LOGIC

DR R.T. WOOD
CHK L. MALONE
APPD E.V. OCHS

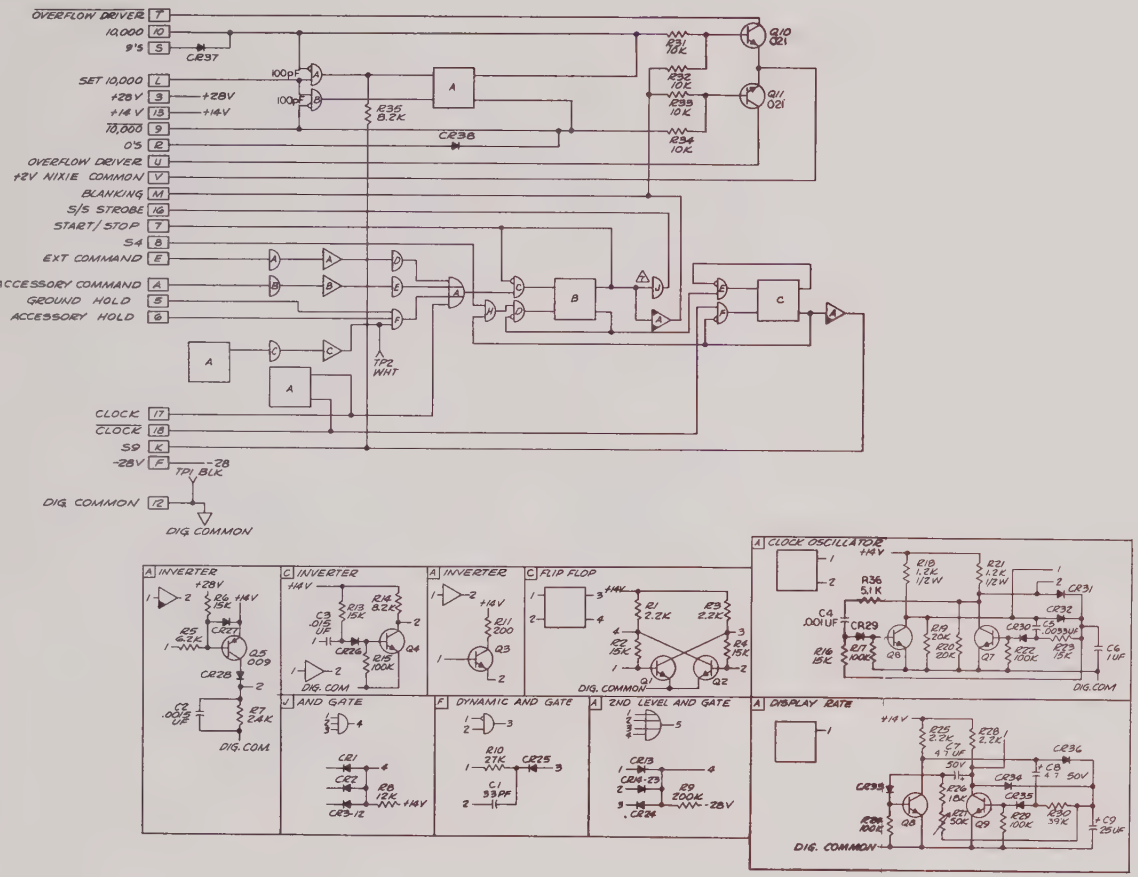
DRN 8671

E | 21793 | 402502 | K

SCALE 2/1

400670 | 5400 | NEXT ASSY | USED ON | APPLICATION

NOTES: UNLESS OTHERWISE SPECIFIED
1. ASSEMBLY PROCEDURE AND PROCESSES [illegible]
2. [illegible] STAMP .10 HIGH BLACK CHARACTERS AND .15 HIGH LOGO, LOCATED AS SHOWN.



1. REFERENCE DESIGNATORS NOT USED ARE
2. NO IN "NAND" GATE J IS A 3.3K.
6. HIGHEST LETTERED REFERENCED DESIGNATOR ON LOGIC ELEMENTS IS SHOWN IN UPPER LEFT HAND CORNER OF LOGIC SCHEMATICS.
   HIGHEST NUMBERED REFERENCE DESIGNATORS:
   R 35 C 78 CR 238
4. ALL VOLTAGES REFERENCED TO DIGITAL COMMON.
5. ALL TRANSISTORS 2N2646.
6. ALL RESISTORS 1/4W, 5%, CARBON.
7. ALL DIODES 914.
8. UNLESS OTHERWISE SPECIFIED

QTY REQD	SYM	ITEM NO.	GOVT OR VENDOR NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION
					LIST OF MATERIAL OR PARTS LIST		

MATERIAL | APPLIED FINISH | HEAT TREATMENT

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON DECIMALS ANGLES
.X ± .030 ± 0° 30'
.XX ± .010
.XXX ± .005
FORMED ANGLES ± 1.0°
RECTANGULARITY BETWEEN SIDS ON THE SAME AXIS SHALL NOT EXCEED .006 TIR.
INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS MIL-S-1000 AND MIL-S-7437

CONTRACT NO.

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

	NAME	DATE
DR	R.T. WOOD	12-15-67
CHK	L. MALONE	1-20-67
APPD	E.K. OCHS	1-20-67
	E. GRIBBLE	1-67
DAN #	671	12-7-67

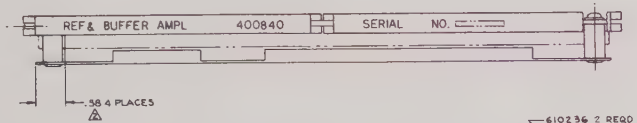
SCEMATIC
CONTROL LOGIC

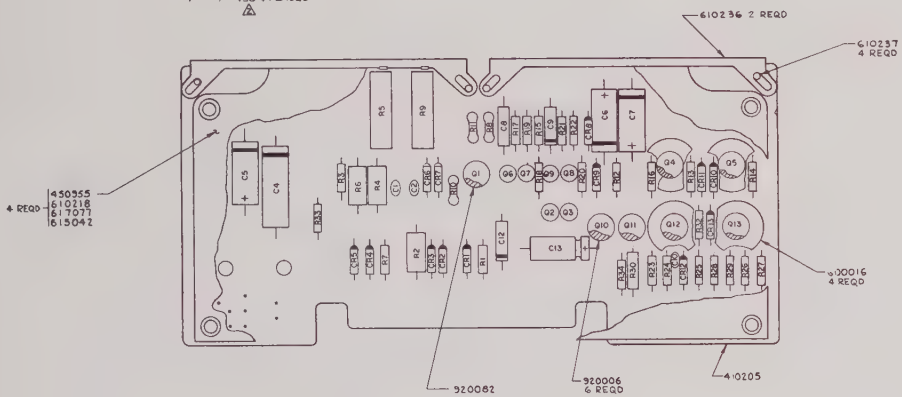
SIZE	CODE IDENT NO.	DWG NO.	
E	21793	430686	F

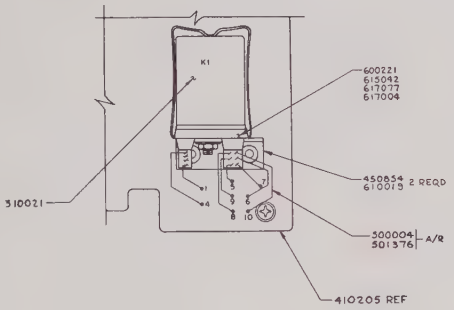
SCALE FULL | WT. | SHEET 1 OF 1

402502	5400	REF	R
NEXT ASSY	USED ON	QTY REQD	

APPLICATION







CROSS REFERENCE CHART	
ITEM NO.	PART NO.
33.0	310021
35.0	410205
38.0	450854
38.5	450955
39.0	500004
40.0	501376
41.0	600016
41.5	610019
42.0	600221
43.0	615218
44.5	610236
44.6	617017
45.0	615042
46.0	617004
47.0	617077
48.0	920006
51.0	920082

REF DES OR ITEM	P/N	DESCRIPTION	QTY
C 1	101058	330 PF DISC	1
C 2	101642	150 PF DISC	1
C 4	121339	.22 UF/100V	1
C 5	110038	25 UF/50V	1
C 6	110026	25 UF/50V	REF
C 7	110026	25 UF/50V	REF
C 8	120005	.001 UF/100V	2
C 9	120005	.001 UF/100V	REF
C10	101145	100 PF DISC	1
C12	121052	.0022 UF/100V	1
C13	111262	10 UF/25V	1
CR 1	220007	10751	1
CR 2	211126	007	3
CR 3	440804	FW BRIDGE ELEMENT	1
CR 4	211083	018	5
CR 5	211083	018	REF
CR 6	211126	007	REF
CR 7	211126	007	REF
CR 8	220012	109588	2
CR 9	220012	109588	REF
CR10	211083	018	REF
CR11	211083	018	REF
CR12	211083	018	REF
CR13	220007	10751	1

REF DES OR ITEM	P/N	DESCRIPTION	QTY
Q 1	200046	016	1
Q 2	200043	293565	6
Q 3	200043	293565	
Q 4	200011	009	3
Q 5	200051	014	2
Q 6	200043	293565	REF
Q 7	200043	293565	REF
Q 8	200043	293565	REF
Q 9	200043	293565	REF
Q10	200011	009	REF
Q11	200035	014	REF
Q12	200055	014	REF
Q13	200011	009	REF
R 1	000512	5.1k	1
R 2	400840	FSV	REF
R 3	000170	27 OHMS	1
R 4	029552	3.648k .05E	1
R 5	026950	POT-5k	1
R 6	400842	FSV	REF
R 7	000681	680 OHMS	2
R 8	010150	200k 1E	2
R 9	040054	POT 50k	1
R10	010213	182k 1%	1
R11	010138	200k 1-	REF
R12	000122	1.2k	1

REF DES OR ITEM	P/N	DESCRIPTION	QTY
R13	000100	100 OHMS	1
R14	000273	27k	2
R15	000242	2.4k	2
R16	000100	100 OHMS	1
R17	000105	1 MEG	2
R19	000243	36k	1
REF R20	000823	6.2k	REF
REF R21	000105	1 MEG	REF
REF R22	000242	2.4k	REF
REF R23	000102	1k	3
REF R24	000673	47k	1
REF R25	000402	1k	REF
REF R26	000671	470	1
R27	000680	6.8k	1
REF R28	000298	29 OHMS	REF
REF R29	000510	51 OHMS	1
R30	001796	1.6k 1/2W	1
REF R32	000102	1k	REF
R33	000681	680	REF
REF R34	000100	10 OHMS	1
-			2
410205	PCB-REF & BUF AMPL		1
430950	SCHEMATIC-REF AMB BUF		REF
450854	BRACKET RELAY MTG-MULT: POLE		1

QTY REQD	SYM	ITEM NO.	GOVT OR VENDOR NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION
1		51.0		920082	YOKES PCB		
1		50.0		590886	SOLDER-WIRE		A/R
1		49.0		590840	SOLDER-BAR		A/R
6				590006	TEARS PAD-LARGE		
5		47.0		617077	WASHER HST LOCK #4		
1		46.0		617004	HEX SLT 4-40 STD		
5		45.0		615042	SCREW PAN 4-40 X 1/4		
1		44.6		610237	PAD-SPACING		
2		44.5		610236	HANDLE-EXTRACTOR		
1		42.0		600221	SOCKET-RELAY, 3 POLE		
4		41.5		610019	RIVET-1/8 SEMI-TUB T 5/32 LG		
4		41.0		600016	HEAT SINK		
A/R		40.0		501376	TUBING-TFE		
2		39.0		500004	WIRE-BUSS		
1		38.5		455265	PLATE-SHIELD REFERENCE AMP BUFFER		

4. SCHEMATIC REFERENCE: 430950
3. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS.
2. HEAT STAMP .10 HIGH BLACK CHARACTERS AND .15 HIGH LOGO, LOCATED AS SHOWN.
1. ALL RESISTORS 1/4W, 5%, CARBON.

MATERIAL

APPLIED FINISH

HEAT TREATMENT

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ANGLES
2 place ± .060 ± 0° 30'
3 place ± .030
.XXX ± .010
ROUNDED CORNERS ± 1/2°
ECCENTRICITY BETWEEN DIA ON THE SAME RISE SHALL NOT EXCEED .010 TIR.
INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS MIL-D-1000 AND MIL-D-70327

CONTRACT NO.

NAME	DATE
DR. F. WAYNE	3-21-66
CHK. TOFT	3-10-66
APPD J. BLANCHE	3-10-66

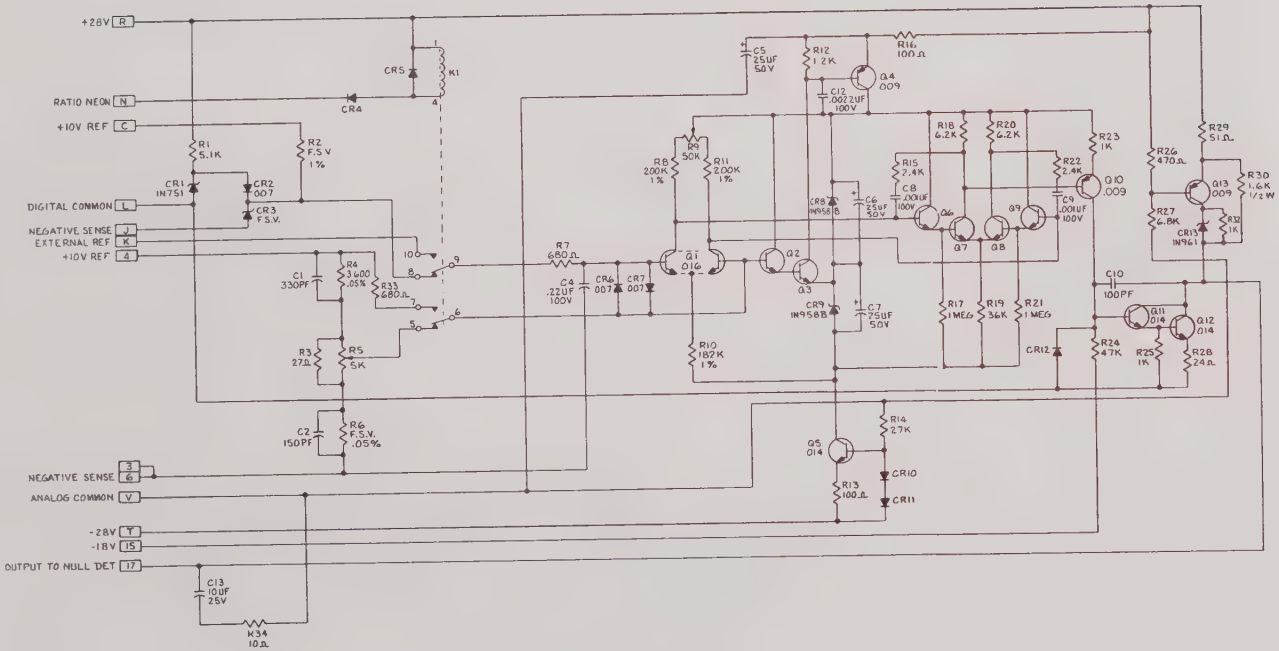
MFG. 3-10-66

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

PC BOARD ASSY - REFERENCE & BUFFER AMPLIFIER

SIZE E | CODE IDENT NO. 21793 | DWG. NO. 400840 | REV. X

SCALE 2/1 | WT. | SHEET 1 OF 1



6 MISSING REFERENCE DESIGNATOR: C1

5 RELAY SHOWN IN DE-ENERGIZED POSITION

4 HIGHEST NUMBERED REFERENCE DESIGNATORS

R 34 Q 13
C 13 CR 13

3. ALL TRANSISTORS 2N3565

2. ALL RESISTORS 1/4W, 5%, CARBON

1. ALL DIODES 018

NOTES: UNLESS OTHERWISE SPECIFIED

QTY REQD	SYM	ITEM NO.	DO'T OR VENDOR NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION

LIST OF MATERIAL OR PARTS LIST

CONTRACT NO.

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

	NAME	DATE
DR CHAUSSEE	1-10-66	
CHK M. CURTIS	JAN 66	
APPD J. NELSON	1-13-66	

SCHEMATIC - REFERENCE & BUFFER AMPLIFIER

MATERIAL

APPLIED FINISH

HEAT TREATMENT

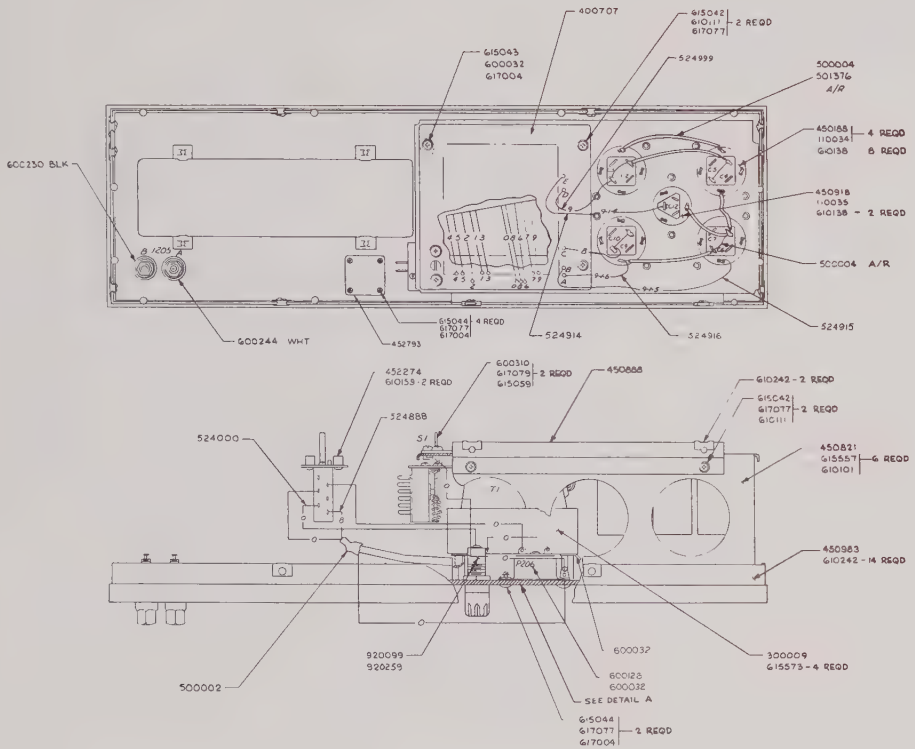
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON DECIMALS: .X ± .030, .XX ± .020, .XXX ± .010, FORMED ANGLES ± 1.0°
ANGLES ± 0° 30'
ECCENTRICITY BETWEEN DIA ON THE SAME AXIS SHALL NOT EXCEED .010 TIR
INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS MIL-D-1000 AND MIL-D-70327

REL 6-10-66
DRN 421

SIZE	CODE IDENT NO.	DWG NO.	
E	21793	430350	J

SCALE NONE WT SHEET 1 OF 1

400840 5400 REF REF



REF DES OR ITEM	P/N	DESCRIPTION	QTY	P/N	DESCRIPTION	QTY
C2	110034	CAP .1000MFD 35V	8	600310	SWITCH-PUSH	1
C3	110034	CAP .1000MFD 35V	REF	610101	NUT PRESS 8-32	8
C4				610111	NUT PRESS 4-40	4
C5				610138	RIVET 1/8 X 3/16LG	10
C6				610150	STANDOFF	2
C7				610242	NUT-CLIP, FLOAT	10
C9				615042	SCREW PPH 4-40	4
C10	110034	CAP .1000MFD 35V	REF		X 1/4 SST	
C12	110035	CAP .50MFD 35CV	1	615043	SCREW PPH 4-40 X	1
T1	300009	TRANSFORMER	1		X 5/16	
	400707	PCB ASSY-PS	1	615044	SCREW PPH 4-40	6
	430318	SCH-PWR SUP 5400	A/R		X 3/8 SST	
	450188	INSULATOR CAP	4	615058	SCREW PPH 8-32	1
	450821	CHASSIS-PWR SUP	1		X 3/16	
	450888	BRACKET-SUPPORT	1	615059	SCREW PPH 8-32	2
	450918	INSULATOR CAP	1		X 3/8	
	450983	FRAME HAWH REAR	1	615557	SCREW PFH 8/32	8
	452274	PLATE MTG ACTOR	1		X 5/16	
				615573	SCREW PFH 8-32	4
	500002	TUBING SHRINK	A/R		X 3/8	
	500004	WIRE-22 GA BUSS	A/R	617004	HEX NUT 4-40 STD	6
	501376	TUBING-30 GA TEF	A/R	617077	WASHER-INT LOCK 4	NO
	524000	WIRE 24GA O COLOR	A/R	617078	WASHER-INT LOCK 8	3
	524814	WIRE-24 GA B-1-4	A/R	920028	SOLDER WIRE	A/R
	524815	WIRE-24 GA B-1-5	A/R	920088	FUSEHOLD	1
	524816	WIRE-24 GA B-1-8	A/R	920258	FUSE 1/2 AMP SLOB	1
	524888	WIRE-24GA B COLOR	A/R		BLOW	
	524889	WIRE-24GA B COLOR	A/R	520414	METAL CAL	1
	880037	LUG SOLDER	3	520258	PLATE COVER	1
	880128	RECEP AC	1			
	880230	BINDING POST BLK	1			
	880244	BINDING POST WHT	1			

QTY REQD	SYM	ITEM NO.	GOVT OR VENDOR NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION

LIST OF MATERIAL OR PARTS LIST

400677	5400	1
NEXT DWG	USED ON	REQ'D / PARA REF
APPLICATION		QTY REQD

MATERIAL: SEE L/M

APPLIED FINISH

HEAT TREATMENT

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON: DECIMALS .X ± .1, .XX ± .030, .XXX ± .010; ANGLES ± 0° 30'
FORMED ANGLES ± 1.0°
ECCENTRICITY BETWEEN DIA ON THE SAME AXIS SHALL NOT EXCEED .010 TIR.
INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS MIL-D-1000 AND MIL-D-70327

CONTRACT NO.

	NAME	DATE
DR	T. WAYE	11 FEB 1966
CHK	T. OFT	14 FEB 1966
APPD	J. BRUCE	17 FEB 66

REL 6-10-66
DAN # 418 88

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

REAR PANEL ASSY - 5400

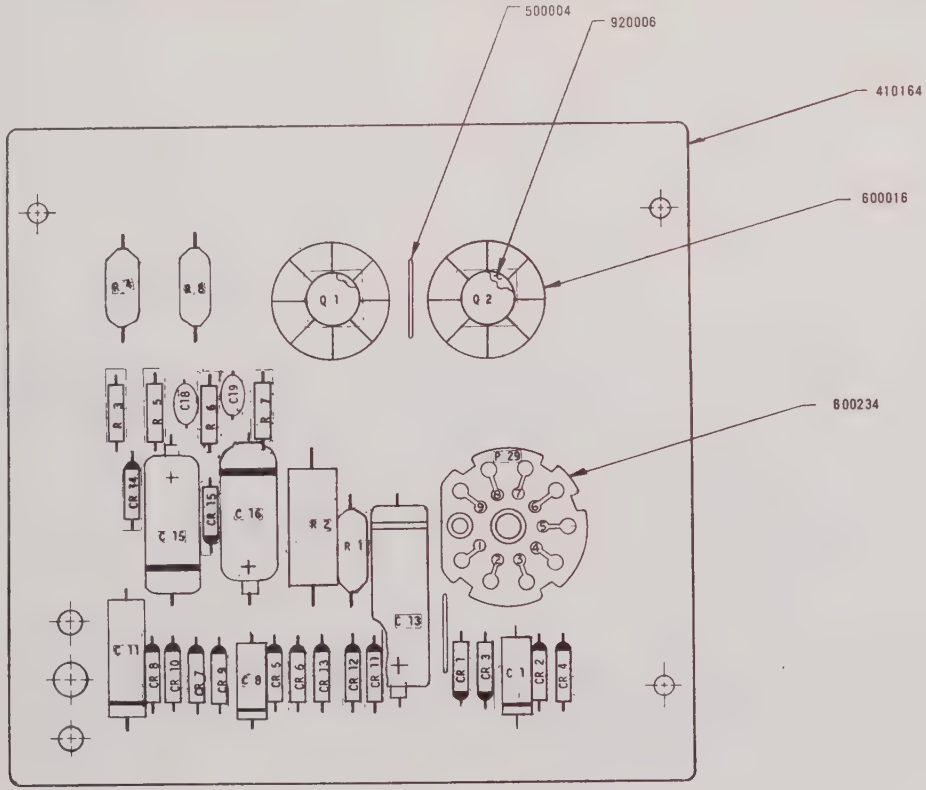
SIZE E | CAGE IDENT NO. 21793 | DWG NO. 400684 | X

SCALE 1/1 | WT | SHEET 1 OF 1

2 SCHEMATIC REFERENCE 430318

1 ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS

NOTES: UNLESS OTHERWISE SPECIFIED



4. ALL RESISTORS ARE IN OHMS.
3. SCHEMATIC REFERENCE: 430318.
2. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS.
1. ALL RESISTORS ARE 1/4W, ± 5%, CARBON

NOTES: UNLESS OTHERWISE SPECIFIED

NEXT ASSY	USED ON	NEXT ASSY	FINAL ASSY
400684	5400	1	1

APPLICATION	QTY REQD

SYMBOLS
APPLICABLE TO DANA LABORATORIES INC. ONLY
SA..... SUB-ASSY MRA.....MAJOR REPL ASSY
MA.....MODULE ASSY CA.....COMPLETE ASSY

QTY REQD	SYM	ITEM NO.	GOV'T IDENT NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	SPECIFICATION

LIST OF MATERIALS OR PARTS LIST

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS: X ± .030, XX ± .020, XXX ± .010
ANGLES ± 0° 30'

MATERIAL

APPLIED FINISH

DRAWN	W. Edie	13 OCT. 1965
CHECK	Toft	13 OCT 1965
ENGR		
APPR		10/14/65

APPROVED

APPROVED

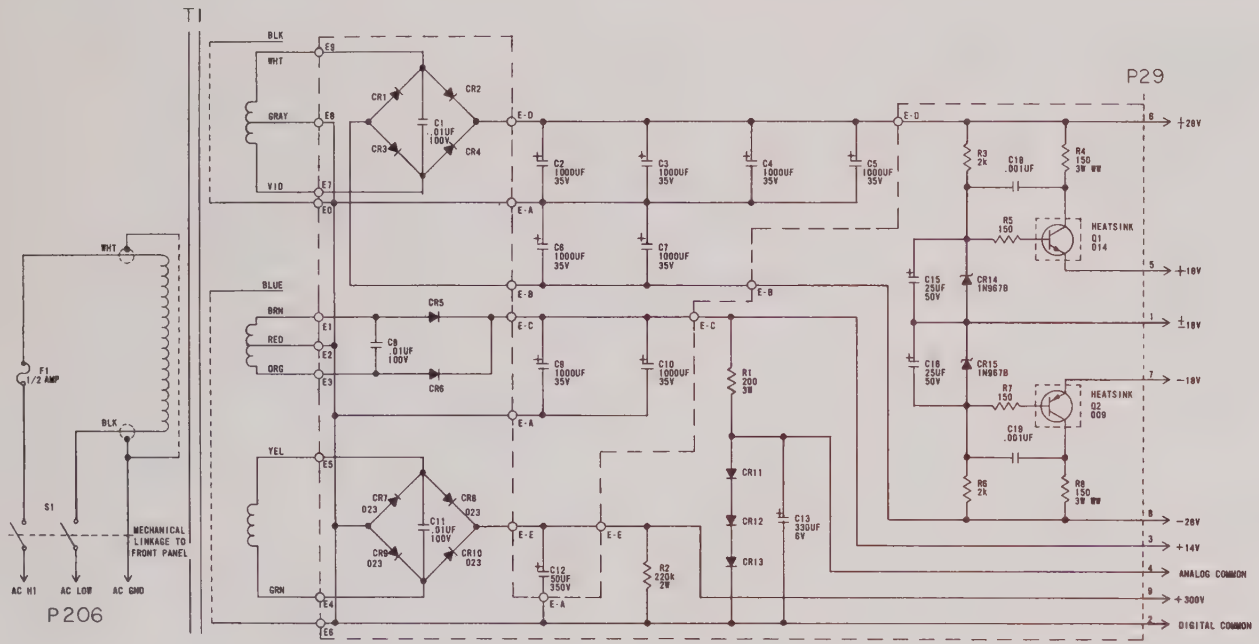
Per 11-17-65
DPN # 200

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

P.C. BOARD ASS'Y-
POWER SUPPLY

CODE IDENT NO.	SIZE		
21793	C	400707	M

SCALE 2/1 | WEIGHT | SHEET 1 OF 2



3. HIGHEST REFERENCE DESIGNATORS ARE: C19, CR15, F1, Q2, R9, T1
2. ALL DIODES ARE SD 4'S.
1. ALL RESISTORS ARE 1/4W, 5%, CARBON.

NOTE: UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
		LIST OF MATERIAL OR PARTS LIST			

400684	5400	REF	REF
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: DECIMALS X .030, XX .020, XXX .010; ANGLES 0° 30'; FORMED ANGLES ±1°

MATERIAL

FINISH

CONTRACT NO.

DRAWN A CHAUSSEE 9-17-65

CHECK J NELSON 9/[illegible]/65

COG. ENGR

PROJ ENGR

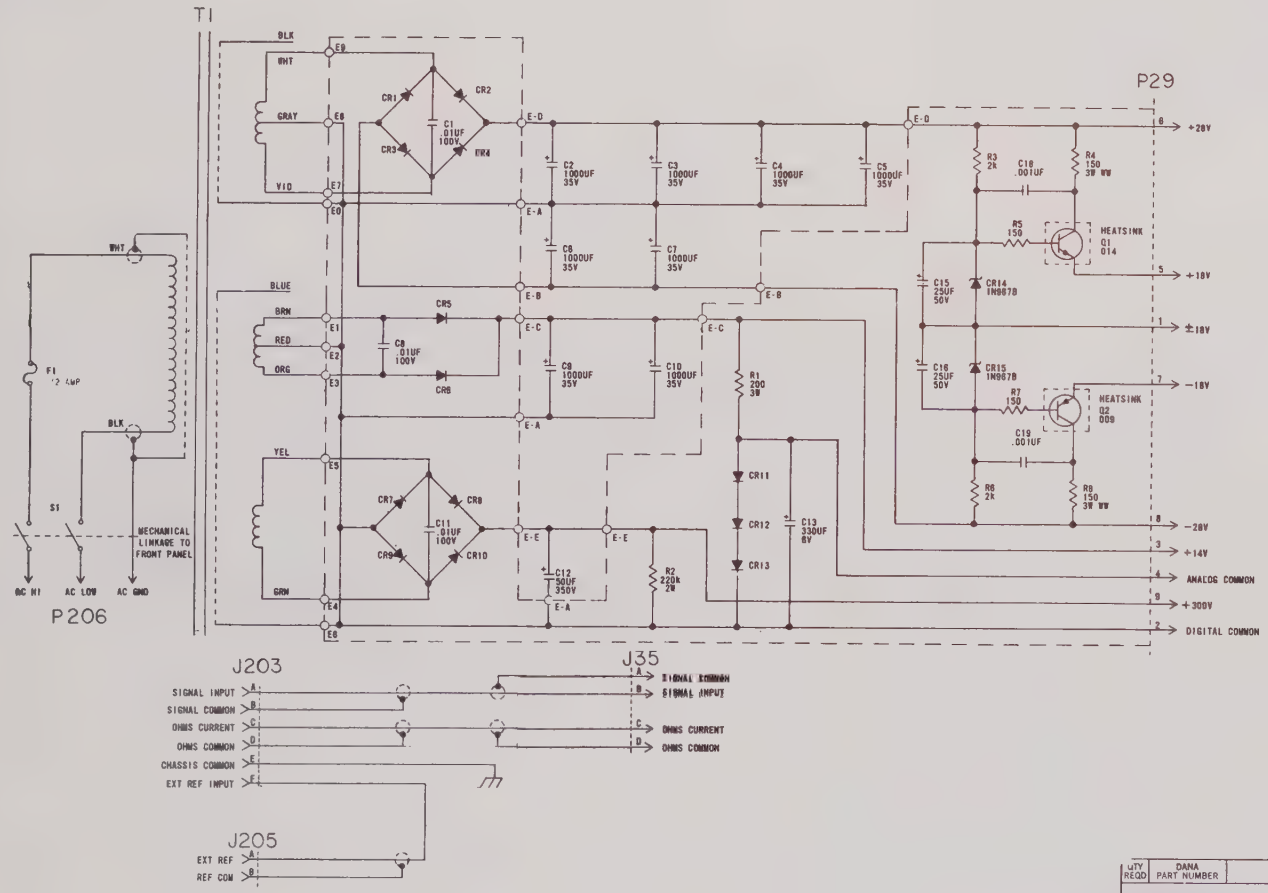
REL 12-10-65 DRN # 214 SDM

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC - PWR SUP REAR PANEL

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	430318	F

SCALE — WT — SHEET 1 OF 1



3. HIGHEST REFERENCE DESIGNATORS ARE, C18, CR15, F1, Q2, R8, T1
2. ALL DIODES ARE SD 4'S.
1. ALL RESISTORS ARE 1/4W, 5%, CARBON

NOTE: UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON:
DECIMALS: X .030, XX .020, XXX .010
ANGLES 0° 30'
FORMED ANGLES 1.0
MATERIAL
FINISH -

CONTRACT NO.

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

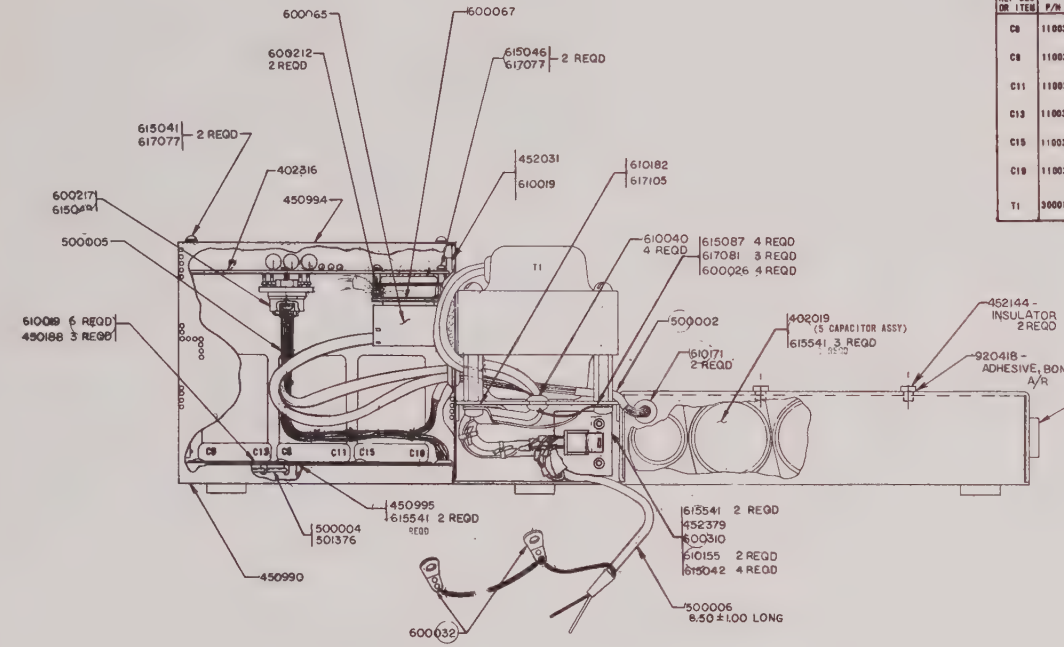
DRAWN	L Wood	4-20-67
CHECK	J Mora	5/17/67
COG ENGR		
PROJ ENGR		5/18/67

SCHEMATIC - PWR SUP REAR PANEL

402006	5400-1	REF	PWR
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

SIZE D | CODE IDENT NO. 21793 | DWG NO. 430613 | REV B

SCALE NONE | WT | SHEET



REF DES OR ITEM	P/N	DESCRIPTION	QTY
C9	110034	1000 MFD 35V (DUAL)	6
C8	110034	1000 MFD 35V (DUAL)	REF
C11	110034	1000 MFD 35V (DUAL)	REF
C13	110034	1000 MFD 35V (DUAL)	REF
C15	110034	1000 MFD 35V (DUAL)	REF
C19	110034	1000 MFD 35V (DUAL)	REF
T1	300017	XMFR PWR	1

REF DES OR ITEM	P/N	DESCRIPTION	QTY
	402018	CAP. ASSY	1
	402316	PCB ASSY PWR SUP	1
	450188	INSULATOR CAP.	3
	450360	INS-CARD BRD	4
	450898	TOP AND BOTTOM CHASSIS PWR SUP WELDED	1
	450901	CHASSIS PWR SUP MAIN	REF
	450902	HOUSING 3 CAP.	1
	450904	SHIELD 3 CAP	1
	450905	BRKT 3 CAPACITOR	1
	452031	GUIDE CARD	2
	452379	PLATE MTG PWR SWITCH INSULATED	1
	500002	TUBING SHRINK .153 I.D.	A/R
	500004	WIRE 22 GA BUSS TINNED	A/R
	500005	TIE CORD NYLON	A/R
	500006	CABLE STORM	A/R
	501378	TUBING 20 GA TEF	A/R
	524006	WIRE 24 GA STR B COLOR	A/R
	524008	WIRE 24 GA STR S COLOR	A/R
	524012	WIRE 24 GA STR 0-1-2 COLOR	A/R
	524013	WIRE 24 GA STR 0-1-3 COLOR	A/R
	524014	WIRE 24 GA STR 0-1-4 COLOR	A/R
	524015	WIRE 24 GA STR 0-1-5 COLOR	A/R
	524016	WIRE 24 GA STR 0-1-6 COLOR	A/R
	524017	WIRE 24 GA STR 0-1-7 COLOR	A/R
	524018	WIRE 24 GA STR 0-1- COLOR	A/R
	524024	WIRE 24 GA STR 0-2-4	A/R
	524025	WIRE 24 GA STR 0-2-5 COLOR	A/R
	524026	WIRE 24 GA STR 0-2-6 COLOR	A/R
	524999	WIRE 24 GA STR N COLOR	A/R

REF DES OR ITEM	P/N	DESCRIPTION	QTY
	980026	LUG SOLDER	1
	980052	LUG SOLDER	2
	600065	HOOD 2 WACLAMP	1
	600067	CONN-DA-15S	1
	609212	SCREW LOCK ASSY PEN 20418-2	2
	600217	CONN 9 PIN EBY 9965-1	1
	600510	SWITCH PUSH BRKT STACKPOLE S-28	1
	610019	RIVET 1/8 SEMI-TUB X 5/32 LG	10
	610022	RIVET-SEMI-TUB X 7/32 LG. NI	8
	610090	GROMMET-RUB, 3/8 INCH I.D. X 3/8	4
	610092	NUT-FLOATING, ES 6A	4
	610111	NUT-PRESS, 6-40	6
	610171	GROMMET-BLK VINYL 5/16 OD X 3/16 ID	2
	610182	CLAMP-CABLE	1
	610155	STDOFF-SMS 1/4 HEX 6-40 X 3/4	2
	615041	SCREW PPH 4-40 X 3/16 STLS	2
	615042	SCREW PPH 4-40 X 1/4 STLS	4
	615046	SCREW PPH 4-40 X 1/2 STLS	2
	615048	SCREW PPH 4-40 X 3/4 STLS	1
	615061	SCREW PPH 6-32 X 1/2 STLS	1
	615087	SCREW PPH 10-32 X 1/4 STLS	4
	615542	SCREW PPH 4-40 X 1/4 STLS	7
	617077	WASHER INT LOCK 4 STLS	4
	617081	WASHER INT LOCK 10 STLS	3
	617105	WASHER FLAT LSER 10 STLS	1
	920026	SOLDER-WIRE .031DIA/37 RESIN CORE	A/R
	452144	INSULATOR, NYLON	2
	920418	ADHESIVE, BOND	A/R

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
		LIST OF MATERIAL OR PARTS LIST			

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON: DECIMALS .XX ±.030 .XXX ±.010 | ANGLES 0° 30' | FORMED ANGLES 1.0
MATERIAL
FINISH

CONTRACT NO.

DRAWN	M. BREAK	7 OCT 1964
CHECK	T. WRYE	10 OCT 1964
COG ENGR	M. CURTIS	10 OCT 1964
PROJ ENGR		9/16/65

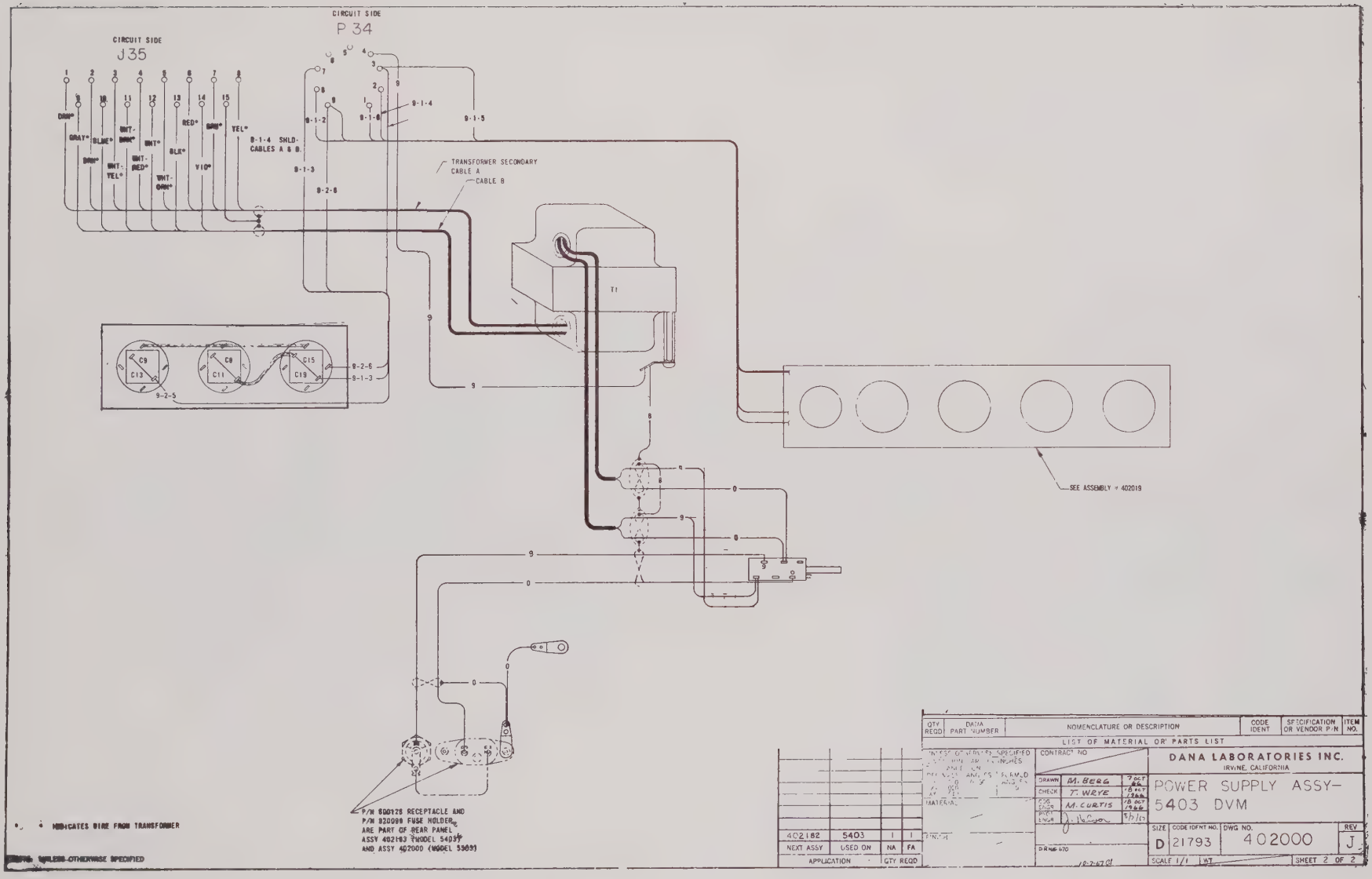
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

POWER SUPPLY ASSY
5403 DVM

SIZE	CODE IDENT NO.	DWG NO.
D	21793	402000

SCALE 1/1 WT

402182	5403	1	1
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	



QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
		LIST OF MATERIAL OR PARTS LIST			

402182	5403	1	1
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

CONTRACT NO

DRAWN	M. BERG	7 OCT 66
CHECK	T. WRYE	10 OCT 1966
CGS ENGR	M. CURTIS	10 OCT 1966
PROJ ENGR		5/10

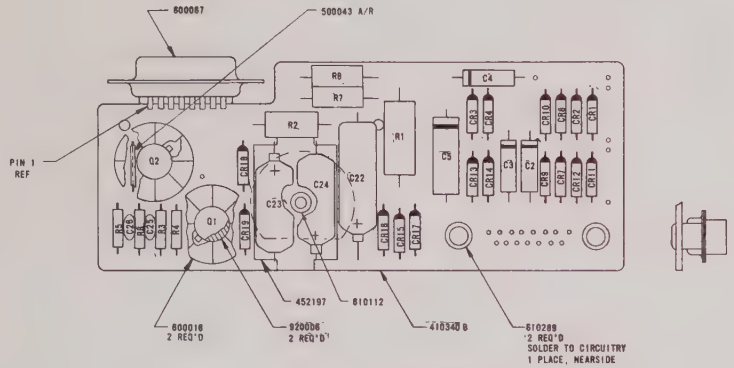
DRWG 670

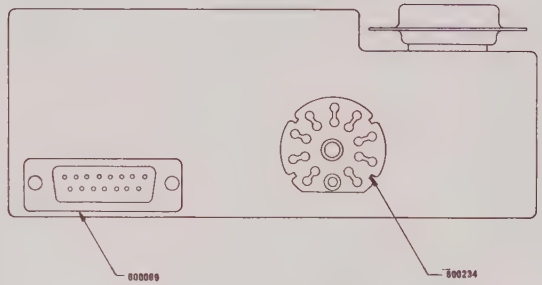
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

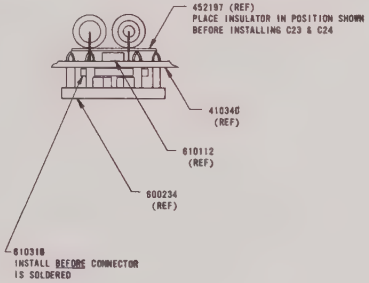
POWER SUPPLY ASSY- 5403 DVM

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	402000	J

SCALE 1/1 | WT | SHEET 2 OF 2







REF DES OR ITEM	P/N	DESCRIPTION
C2	121088	01UF/100V
C3	121088	01UF/100V
C4	121088	01UF/100V
C5	120072	91UF/600V
C22	110041	250UF/8V
C23	110036	25UF/50V
C24	110036	25UF/50V
C25	101174	.001UF DISC
C26	101174	.001UF DISC
CR1	210004	SD4
CR2	210004	SD4
CR3	210014	023
CR4	210014	023
CR5	210004	SD4
THRU		
CR12	210004	SD4
CR13	210014	023
CR14	210014	023
CR15	210004	SD4
THRU		
CR17	210004	SD4
CR18	220015	1N967B
CR19	220015	1N967B
Q1	200035	014
Q2	200011	009
R1	031450	220Ω/2W
R2	030008	200 OHMS/3W
R3	000202	2k
R4	000202	2k

REF DES OR ITEM	P/N	DESCRIPTION	QTY
R5	000151	150 OHMS	
R6	000151	150 OHMS	
R7	030007	150 OHMS/3W	
R8	030007	150 OHMS/3W	
	410340	PCB PWR SUP	1
	452197	INSULATOR CAP	1
		PWR SUP	
	500043	WIRE 24 GA WHT	A/R
		TEFLON COATED	
	800018	HEAT SINK IERC	2
	800067	CONN DA-15S	1
	800069	CONN DA-15P-B	1
	800234	CON 9 SOCKET	1
	810112	NUT PRESS 4-40	1
	810289	SPACER 3-16 LG	2
	920008	TRANS PAD LARGE	2

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.

LIST OF MATERIAL OR PARTS LIST

402000	5403	1	1
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON:
DECIMALS: X .030, XX .020, XXX .010
ANGLES 0° 30'
FORMED ANGLES T.D.

MATERIAL

FINISH

CONTRACT NO.

DRAWN T.T. Kang 12-9-66
CHECK [illegible] 1-17-67
COG. ENGR [illegible] 1/19/67
PROJ ENGR [illegible] 1/19/67

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

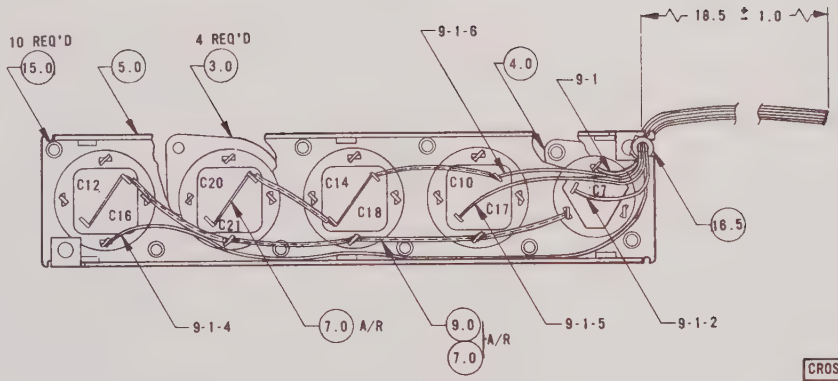
PC BOARD ASSY
POWER SUPPLY

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	402316	D

SCALE 2/1 | WT | SHEET 1 OF 1

3. SCHEMATIC REFERENCE: 430571
2. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS.
1. ALL RESISTORS ARE 1/4 W, ± 5%, CARBON.

NOTE: UNLESS OTHERWISE SPECIFIED



CROSS REFERENCE CHART	
ITEM NO.	PART NO.
3.0	450188
4.0	450918
5.0	450996
7.0	500004
8.0	500005
9.0	501376
15.0	610019
16.5	610158

REF DES	B/M ITEM	DESCRIPTION
C7	2.0	50UF/350V
C16	1.0	1000UF/35V(DUAL)
C12		
C21		
C20		
C18		
C14		
C17	1.0	1000UF/35V(DUAL)
C10		

QTY REQD	SYM	ITEM NO.	GOV'T OR VENDOR NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION

LIST OF MATERIAL OR PARTS LIST

402000	5403	1	1
402319	5500	1	1
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

MATERIAL

APPLIED FINISH

HEAT TREATMENT

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS: .X ± .030, .XX ± .020, .XXX ± .010
ANGLES ± 0° 30'
FORMED ANGLES ± 1.0°
ECCENTRICITY BETWEEN DIA ON THE SAME AXIS SHALL NOT EXCEED .010 TIR.
INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS MIL-D-1000 AND MIL-D-70327

CONTRACT NO.

	NAME	DATE
DR	M. Berg	10-13-66
CHK	M. Curtis	11/2/66
APPD	J. Hoppe	5/7/67

DRN # 651

8-12-67

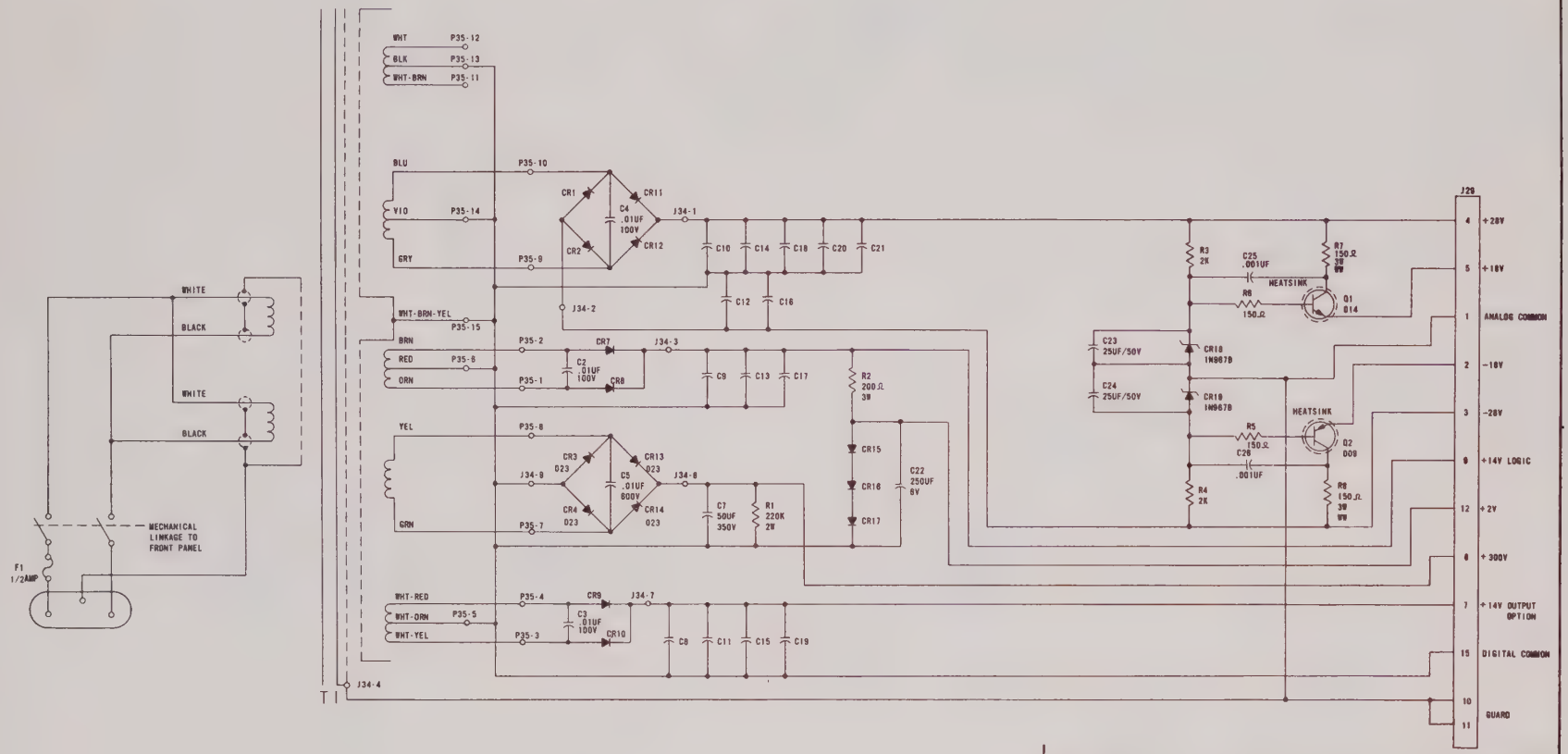
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

CAPACITOR ASSEMBLY-5 CAP

SIZE	CODE IDENT NO.	DWG NO.	
C	21793	402019	B
SCALE 1/1	WT	SHEET 1 OF 1	

2. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS.
1. SCHEMATIC REFERENCE: 430399

NOTES: UNLESS OTHERWISE SPECIFIED



3. ALL CAPACITORS 1000-MICROFARADS 35 V.
2. ALL DIODES SD 4.
1. ALL RESISTORS 1/4W, CARBON 5%.

NOTE: UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: DECIMALS X .01, XX .005, XXX .010 | ANGLES 0° 30' | FORMED ANGLES 1.0

MATERIAL

FINISH

CONTRACT NO.

DRAWN J.T. Berg 12-9-66
CHECK G.E. Fryer 12-16-66
COG. ENGR D. Fryer 12-16-66
PROJ ENGR D. Wolff 12-23-66

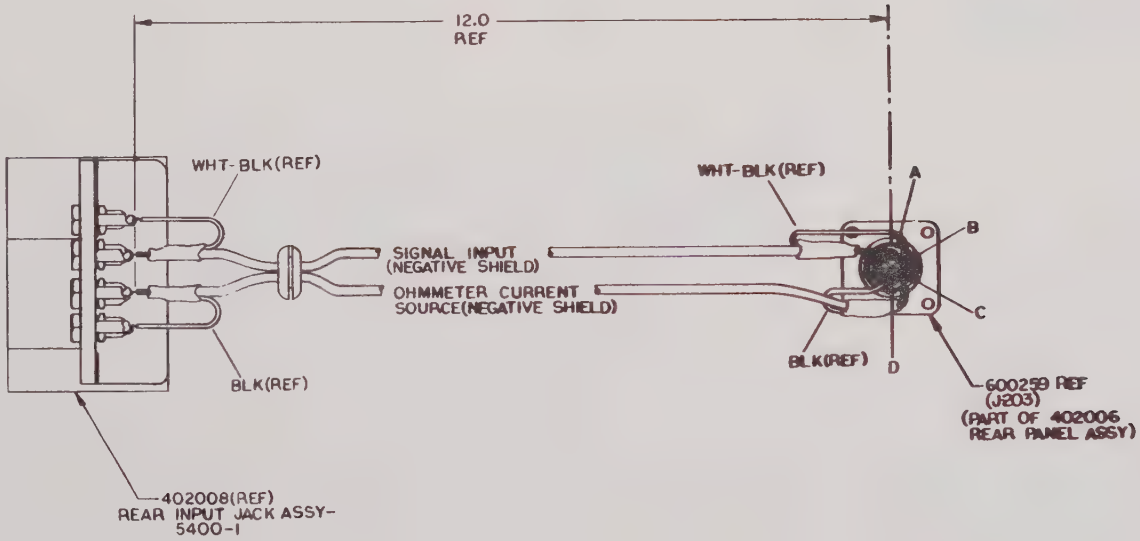
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC— POWER SUPPLY,

SIZE	CODE IDENT NO.	DWG NO.	REV
D	—	430571	A

SCALE — WT — SHEET 1 OF 1

102000	5403	REF	REF
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	



QTY REQD	SYM	ITEM NO.	GOV'T OR VENDOR NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION

LIST OF MATERIAL OR PARTS LIST

MATERIAL

APPLIED FINISH

HEAT TREATMENT

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES

TOLERANCES ON DECIMALS: .X ± .030; .XX ± .020; .XXX ± .010 — ANGLES ± 0° 30'

FORMED ANGLES ± 1.0°

ECCENTRICITY BETWEEN DIA ON THE SAME AXIS SHALL NOT EXCEED .005 TIR.

INTERPRET DRAWING IN ACCORDANCE WITH STANDARD MIL-D-1000 AND MIL-D-70327

CONTRACT NO.

	NAME	DATE
DR.	[illegible]	26 APR 1966
CHK	T. [illegible]	[illegible]
APPD	[illegible]	

Rev 6-17-66

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

WIRING DIAGRAM — ENCLOSURE, 5400-1

SIZE	CODE IDENT NO.	DWG NO.
C	———	430400

SCALE FULL | WT ——— | SHEET 1 OF 1

NOTES: UNLESS OTHERWISE SPECIFIED

PARTS LIST

ASSEMBLY 400691 **DISPLAY ASSEMBLY**

REF. DESIG.	PART NO.	DESCRIPTION							
CR01	210004	DIODE	SILICO	SD4				DIODES IN	SD4
CR02	210004	DIODE	SILICO	SD4				DIODES IN	SD4
CR03	210004	DIODE	SILICO	SD4				DIODES IN	SD4
C01	110041	CAP	ELECT	250	MFD	6 V	20%	DUCATI	250-6
R01	001107	RES	CARBON	39	K	5%	1 W	OHMITE	RC32GF393J
R02	001698	RES	CARBON	20	K	5%	1 W	OHMITE	RC32GF203J
R03	000224	RES	CARBON	220	K	5%	1/4 W1	OHMITE	RC07GF224J
R04	001107	RES	CARBON	39	K	5%	1 W	OHMITE	RC32GF393J
R05	001698	RES	CARBON	20	K	5%	1 W	OHMITE	RC32GF203J
R06	030005	RES	CARBON	100	K	5%	2 W	OHMITE	RC42GF104J
R07	030005	RES	CARBON	100	K	5%	2 W	OHMITE	RC42GF104J
R08	030005	RES	CARBON	100	K	5%	2 W	OHMITE	RC42GF104J
R09	030005	RES	CARBON	100	K	5%	2 W	OHMITE	RC42GF104J
R10	030005	RES	CARBON	100	K	5%	2 W	OHMITE	RC42GF104J
R11	030005	RES	CARBON	100	K	5%	2 W	OHMITE	RC42GF104J
R12	030005	RES	CARBON	100	K	5%	2 W	OHMITE	RC42GF104J
R13	030012	RES	CARBON	130	K	5%	1 W	OHMITE	RC32GF134J
R14	030012	RES	CARBON	130	K	5%	1 W	OHMITE	RC32GF134J
R15	030012	RES	CARBON	130	K	5%	1 W	OHMITE	RC32GF134J
R16	030012	RES	CARBON	130	K	5%	1 W	OHMITE	RC32GF134J
R17	030012	RES	CARBON	130	K	5%	1 W	OHMITE	RC32GF134J
R18	030012	RES	CARBON	130	K	5%	1 W	OHMITE	RC32GF134J
R19	030012	RES	CARBON	130	K	5%	1 W	OHMITE	RC32GF134J
R20	000914	RES	CARBON	910	K	5%	1/4 W	OHMITE	RC07GF914J
R21	000914	RES	CARBON	910	K	5%	1/4 W	OHMITE	RC07GF914J
R22	000914	RES	CARBON	910	K	5%	1/4 W	OHMITE	RC07GF914J
R23	000914	RES	CARBON	910	K	5%	1/4 W	OHMITE	RC07GF914J
R24	000914	RES	CARBON	910	K	5%	1/4 W	OHMITE	RC07GF914J
R25	000914	RES	CARBON	910	K	5%	1/4 W	OHMITE	RC07GF914J
R26	000914	RES	CARBON	910	K	5%	1/4 W	OHMITE	RC07GF914J
R27	000914	RES	CARBON	910	K	5%	1/4 W	OHMITE	RC07GF914J
R28	000914	RES	CARBON	910	K	5%	1/4 W	OHMITE	RC07GF914J
R29	000914	RES	CARBON	910	K	5%	1/4 W	OHMITE	RC07GF914J
R30	000914	RES	CARBON	910	K	5%	1/4 W	OHMITE	RC07GF914J

PARTS LIST

ASSEMBLY 400862 **DECADE ASSEMBLY**

REF. DESIG.	PART NO.	DESCRIPTION							
CR01	211083	DIODE SILICO	018			1	DANA	211083
CR02	211083	DIODE SILICO	018			1	DANA	211083
CR03	211083	DIODE SILICO	018			1	DANA	211083
CR04	211083	DIODE SILICO	018			1	DANA	211083
CR25	211083	DIODE SILICO	018			1	DANA	211083
CR36	211083	DIODE SILICO	018			1	DANA	211083
CR37	211083	DIODE SILICO	018			1	DANA	211083
CR38	211083	DIODE SILICO	018			1	DANA	211083
CR39	211083	DIODE SILICO	018			1	DANA	211083
CR40	211083	DIODE SILICO	018			1	DANA	211083
CR41	211083	DIODE SILICO	018			1	DANA	211083
CR42	211083	DIODE SILICO	018			1	DANA	211083
CR43	211083	DIODE SILICO	018			1	DANA	211083
CR44	211083	DIODE SILICO	018			1	DANA	211083
CR45	211083	DIODE SILICO	018			1	DANA	211083
CR46	211083	DIODE SILICO	018			1	DANA	211083
CR47	211083	DIODE SILICO	018			1	DANA	211083
CR48	211083	DIODE SILICO	018			1	DANA	211083
C01	100012	CAP CERAM	33 PFD	500 V	10%		AEROVOX	TCD-N750
Q01	200037	TRANS SILICO NPN	2N3646				FAIRCHILD	2N3646
Q02	200037	TRANS SILICO NPN	2N3646				FAIRCHILD	2N3646
Q04	200035	TRANS SILICO NPN	014				DANA	200035
B-R01	000222	RES CARBON	2.2 K	5%	1/4 W1		OHMITE	RC07GF222J
C-R01	000222	RES CARBON	2.2 K	5%	1/4 W1		OHMITE	RC07GF222J
D-R01	000222	RES CARBON	2.2 K	5%	1/4 W1		OHMITE	RC07GF222J
R02	000153	RES CARBON	15 K	5%	1/4 W1		OHMITE	RC07GF153J
A-R03	000122	RES CARBON	1.2 K	5%	1/4 W1		OHMITE	RC07GF122J
B-R03	000222	RES CARBON	2.2 K	5%	1/4 W1		OHMITE	RC07GF222J
C-R03	000222	RES CARBON	2.2 K	5%	1/4 W1		OHMITE	RC07GF222J
D-R03	000222	RES CARBON	2.2 K	5%	1/4 W1		OHMITE	RC07GF222J
R04	000153	RES CARBON	15 K	5%	1/4 W1		OHMITE	RC07GF153J
R08	000243	RES CARBON	24 K	5%	1/4 W1		OHMITE	RC07GF243J
R09	000273	RES CARBON	27 K	5%	1/4 W1		OHMITE	RC07GF273J
R11	000204	RES CARBON	200 K	5%	1/4 W		OHMITE	RC07GF204J
R12	000103	RES CARBON	10 K	5%	1/4 W1		OHMITE	RC07GF103J
R13	000103	RES CARBON	10 K	5%	1/4 W1		OHMITE	RC07GF103J
R14	001698	RES CARBON	20 K	5%	1 W		OHMITE	RC32GF203J
R15	001107	RES CARBON	39 K	5%	1 W		OHMITE	RC32GF393J

PARTS LIST

ASSEMBLY 400862 **DECADE ASSEMBLY**

REF. DESIG.	PART NO.	DESCRIPTION						
R16	000103	RES	CARBON	10 K	5%	1/4 W1	OHMITE	RC07GF103J
R17	000103	RES	CARBON	10 K	5%	1/4 W1	OHMITE	RC07GF103J
R18	000103	RES	CARBON	10 K	5%	1/4 W1	OHMITE	RC07GF103J
R19	001107	RES	CARBON	39 K	5%	1 W	OHMITE	RC32GF393J
R20	001698	RES	CARBON	20 K	5%	1 W	OHMITE	RC32GF203J
R21	000333	RES	CARBON	33 K	5%	1/4 W	OHMITE	RC07GF333J
R22	000333	RES	CARBON	33 K	5%	1/4 W	OHMITE	RC07GF333J
R23	000333	RES	CARBON	33 K	5%	1/4 W	OHMITE	RC07GF333J
R24	000333	RES	CARBON	33 K	5%	1/4 W	OHMITE	RC07GF333J
R25	000333	RES	CARBON	33 K	5%	1/4 W	OHMITE	RC07GF333J
R26	000333	RES	CARBON	33 K	5%	1/4 W	OHMITE	RC07GF333J
R27	000223	RES	CARBON	22 K	5%	1/4 W	OHMITE	RC07GF223J
R28	000223	RES	CARBON	22 K	5%	1/4 W	OHMITE	RC07GF223J
R29	000223	RES	CARBON	22 K	5%	1/4 W	OHMITE	RC07GF223J
R30	000223	RES	CARBON	22 K	5%	1/4 W	OHMITE	RC07GF223J

PARTS LIST

ASSEMBLY 400891 **DECADE ASSEMBLY**

REF. DESIG.	PART NO.	DESCRIPTION						
CR01	211083	DIODE SILICO	018			1	DANA	211083
CR02	211083	DIODE SILICO	018			1	DANA	211083
CR03	211083	DIODE SILICO	018			1	DANA	211083
CR04	211083	DIODE SILICO	018			1	DANA	211083
CR25	211083	DIODE SILICO	018			1	DANA	211083
CR36	211083	DIODE SILICO	018			1	DANA	211083
CR37	211083	DIODE SILICO	018			1	DANA	211083
CR38	211083	DIODE SILICO	018			1	DANA	211083
CR39	211083	DIODE SILICO	018			1	DANA	211083
CR40	211083	DIODE SILICO	018			1	DANA	211083
CR41	211083	DIODE SILICO	018			1	DANA	211083
CR42	211083	DIODE SILICO	018			1	DANA	211083
CR43	211083	DIODE SILICO	018			1	DANA	211083
CR44	211083	DIODE SILICO	018			1	DANA	211083
CR45	211083	DIODE SILICO	018			1	DANA	211083
CR46	211083	DIODE SILICO	018			1	DANA	211083
CR47	211083	DIODE SILICO	018			1	DANA	211083
CR48	211083	DIODE SILICO	018			1	DANA	211083
C01	101182	CAP CERAM	47 PFD	500 V	10%1		AEROVOX	TCD-N750
E-C01	100005	CAP CERAM	22 PFD	500 V	10%		AEROVOX	TCD-N750
Q01	200037	TRANS SILICO NPN	2N3646				FAIRCHILD	2N3646
Q04	200079	TRANS	021				DANA	200079
R01	000122	RES CARBON	1.2 K		5%	1/4 W1	OHMITE	RC07GF122J
R02	000153	RES CARBON	15 K		5%	1/4 W1	OHMITE	RC07GF153J
R03	000122	RES CARBON	1.2 K		5%	1/4 W1	OHMITE	RC07GF122J
R04	000153	RES CARBON	15 K		5%	1/4 W1	OHMITE	RC07GF153J
R08	000243	RES CARBON	24 K		5%	1/4 W1	OHMITE	RC07GF243J
R09	000273	RES CARBON	27 K		5%	1/4 W1	OHMITE	RC07GF273J
R11	000204	RES CARBON	200 K		5%	1/4 W	OHMITE	RC07GF204J
R12	000103	RES CARBON	10 K		5%	1/4 W1	OHMITE	RC07GF103J
R13	000103	RES CARBON	10 K		5%	1/4 W1	OHMITE	RC07GF103J
R14	001698	RES CARBON	20 K		5%	1 W	OHMITE	RC32GF203J
R15	001107	RES CARBON	39 K		5%	1 W	OHMITE	RC32GF393J
R16	000103	RES CARBON	10 K		5%	1/4 W1	OHMITE	RC07GF103J
R17	000103	RES CARBON	10 K		5%	1/4 W1	OHMITE	RC07GF103J
R18	000103	RES CARBON	10 K		5%	1/4 W1	OHMITE	RC07GF103J
R19	001107	RES CARBON	39 K		5%	1 W	OHMITE	RC32GF393J
R20	001698	RES CARBON	20 K		5%	1 W	OHMITE	RC32GF203J

PARTS LIST

ASSEMBLY 400891 **DECADE ASSEMBLY**

REF. DESIG.	PART NO.	DESCRIPTION						
R21	000103	RES	CARBON	10 K.	5%	1/4 W1	OHMITE	RC07GF103J
R22	000103	RES	CARBON	10 K	5%	1/4 W1	OHMITE	RC07GF103J
R23	000103	RES	CARBON	10 K	5%	1/4 W1	OHMITE	RC07GF103J
R24	000103	RES	CARBON	10 K	5%	1/4 W1	OHMITE	RC07GF103J
R25	000103	RES	CARBON	10 K	5%	1/4 W1	OHMITE	RC07GF103J
R26	000103	RES	CARBON	10 K	5%	1/4 W1	OHMITE	RC07GF103J
R27	000223	RES	CARBON	22 K	5%	1/4 W	OHMITE	RC07GF223J
R28	000223	RES	CARBON	22 K	5%	1/4 W	OHMITE	RC07GF223J
R29	000223	RES	CARBON	22 K	5%	1/4 W	OHMITE	RC07GF223J
R30	000223	RES	CARBON	22 K	5%	1/4 W	OHMITE	RC07GF223J
R31	000683	RES	CARBON	68 K	5%	1/4 W1	OHMITE	RC07GF683J
R32	000563	RES	CARBON	56 K	5%	1/4 W	OHMITE	RC07GF563J
R33	000473	RES	CARBON	47 K	5%	1/4 W1	OHMITE	RC07GF473J
R34	000473	RES	CARBON	47 K	5%	1/4 W1	OHMITE	RC07GF473J
R35	000473	RES	CARBON	47 K	5%	1/4 W1	OHMITE	RC07GF473J
R36	000473	RES	CARBON	47 K	5%	1/4 W1	OHMITE	RC07GF473J
R37	000473	RES	CARBON	47 K	5%	1/4 W1	OHMITE	RC07GF473J
R38	000204	RES	CARBON	200 K	5%	1/4 W	OHMITE	RC07GF204J

PARTS LIST

ASSEMBLY 400843 **NULL DETECTOR ASSEMBLY**

REF. DESIG.	PART NO.	DESCRIPTION						
CR01	211083	DIODE	SILICO	018		1	DANA	211083
CR02	211083	DIODE	SILICO	018		1	DANA	211083
C01	110036	CAP	ELECT	25 MFD	50 V	20%	DUCATI	25-50
C02	101175	CAP	CERAM	220 PFD	500 V	10%1	AEROVOX	SCD1X5F
C03	110036	CAP	ELECT	25 MFD	50 V	20%	DUCATI	25-50
C04	110040	CAP	ELECT	1 MFD	50 V	20%	DUCATI	1-50
C05	110002	CAP	TANTA	22 MFD	35 V	10%1	KEMET	K22C35K
Q01	200037	TRANS	SILICO NPN	2N3646			FAIRCHILD	2N3646
A-Q02	200055	TRANS	SILICO NPN	FSV			DANA	200055
B-Q02	200055	TRANS	SILICO NPN	FSV			DANA	200055
C-Q02	200055	TRANS	SILICO NPN	FSV			DANA	200055
D-Q02	200055	TRANS	SILICO NPN	FSV			DANA	200055
E-Q02	200055	TRANS	SILICO NPN	FSV			DANA	200055
F-Q02	200055	TRANS	SILICO NPN	FSV			DANA	200055
G-Q02	200055	TRANS	SILICO NPN	FSV			DANA	200055
H-Q02	200055	TRANS	SILICO NPN	FSV			DANA	200055
J-Q02	200055	TRANS	SILICO NPN	FSV			DANA	200055
K-Q02	200054	TTRANS	SILICO NPN	FSV			DANA	200054
L-Q02	200054	TTRANS	SILICO NPN	FSV			DANA	200054
M-Q02	200054	TTRANS	SILICO NPN	FSV			DANA	200054
N-Q02	200054	TTRANS	SILICO NPN	FSV			DANA	200054
P-Q02	200054	TTRANS	SILICO NPN	FSV			DANA	200054
R-Q02	200054	TTRANS	SILICO NPN	FSV			DANA	200054
S-Q02	200054	TTRANS	SILICO NPN	FSV			DANA	200054
T-Q02	200054	TTRANS	SILICO NPN	FSV			DANA	200054
U-Q02	200054	TTRANS	SILICO NPN	FSV			DANA	200054
V-Q02	200054	TTRANS	SILICO NPN	FSV			DANA	200054
Q03	200036	TRANS	SILICO NPN	015			DANA	200036
Q04	200043	TRANS	SILICO NPN	2N3565			FAIRCHILD	2N3565
Q05	200043	TRANS	SILICO NPN	2N3565			FAIRCHILD	2N3565
Q06	200043	TRANS	SILICO NPN	2N3565			FAIRCHILD	2N3565
Q07	200043	TRANS	SILICO NPN	2N3565			FAIRCHILD	2N3565
Q08	200043	TRANS	SILICO NPN	2N3565			FAIRCHILD	2N3565
Q09	200043	TRANS	SILICO NPN	2N3565			FAIRCHILD	2N3565
R01	000473	RES	CARBON	47 K	5%	1/4 W1	OHMITE	RC07GF473J
R02	000333	RES	CARBON	33 K	5%	1/4 W	OHMITE	RC07GF333J
R03	000204	RES	CARBON	200 K	5%	1/4 W	OHMITE	RC07GF204J
R04	040050	RES	VARI	5 K	10%	1/2 W	BOURNS	3067-P-1-K0

PARTS LIST

ASSEMBLY 400843 **NULL DETECTOR ASSEMBLY**

REF. DESIG.	PART NO.	DESCRIPTION						
R05	020193	RES	WW	4948.22 OHM	.01%	1/8 W	JORDAN J11	
R06	000684	RES	CARBON	680 K	5%	1/4 W	OHMITE	RC07GF684J
R07	020194	RES	WW	2400.09 OHM	.01%	1/8 W	JORDAN J11	
R08	000104	RES	CARBON	100 K	5%	1/4 W1	OHMITE	RC07GF104J
R09	000516	RES	CARBON	51 M	5%	1/4 W	OHMITE	RC07GF516J
R10	000104	RES	CARBON	100 K	5%	1/4 W1	OHMITE	RC07GF104J
R11	000133	RES	CARBON	13 K	5%	1/4 W1	OHMITE	RC07GF133J
R12	000432	RES	CARBON	4.3 K	5%	1/4 W1	OHMITE	RC07GF432J
R13	000246	RES	CARBON	24 M	5%	1/4 W	OHMITE	RC07GF246J
R14	000104	RES	CARBON	100 K	5%	1/4 W1	OHMITE	RC07GF104J
R15	000331	RES	CARBON	330 OHM	5%	1/4 W1	OHMITE	RC07GF331J
R16	010113	RES	METAL	15 K	1%	1/4 W	ELECTRA	RN60D1502F
R17	000246	RES	CARBON	24 M	5%	1/4 W	OHMITE	RC07GF246J
R18	040049	RES	VARI	2 K	10%	1/2 W	BOURNS	3067-P-1-20
R19	010272	RES	METAL	154 K	1%	1/4 W	ELECTRA	RN60D1543F
R20	000104	RES	CARBON	100 K	5%	1/4 W1	OHMITE	RC07GF104J
R21	010113	RES	METAL	15 K	1%	1/4 W	ELECTRA	RN60D1502F
R22	010270	RES	WW	12.5 M	1%	1 W	PME	PME70T0
R23	000104	RES	CARBON	100 K	5%	1/4 W1	OHMITE	RC07GF104J
R24	010269	RES	WW	5 M	1%	1/2 W	PME	PME65T0
R25	000334	RES	CARBON	330 K	5%	1/4 W	OHMITE	RC07GF334J
R26	000104	RES	CARBON	100 K	5%	1/4 W1	OHMITE	RC07GF104J
R27	000123	RES	CARBON	12 K	5%	1/4 W1	OHMITE	RC07GF123J
R28	010298	RES	METAL	2.5 M	.25%	1 W	PYROFILM	PME75T225M
R29	000242	RES	CARBON	2.4 K	5%	1/4 W1	OHMITE	RC07GF242J
R30	000113	RES	CARBON	11 K	5%	1/4 W1	OHMITE	RC07GF113J
R31	000104	RES	CARBON	100 K	5%	1/4 W1	OHMITE	RC07GF104J
R32	000123	RES	CARBON	12 K	5%	1/4 W1	OHMITE	RC07GF123J
R33	010298	RES	METAL	2.5 M	.25%	1 W	PYROFILM	PME75T225M
R34	000334	RES	CARBON	330 K	5%	1/4 W	OHMITE	RC07GF334J
R35	000104	RES	CARBON	100 K	5%	1/4 W1	OHMITE	RC07GF104J
R36	010297	RES	METAL	1.25 M	1%	1/2 W	PYROFILM	PME65T2215M
R38	001692	RES	CARBON	4.7 K	5%	1/2 W	OHMITE	RC20GF472J
R39	010267	RES	WW	500 K	.1%	1/4 W1	PME	PME60T2
R40	001703	RES	CARBON	8.2 K	5%	1/2 W	OHMITE	RC20GF822J
R41	001692	RES	CARBON	4.7 K	5%	1/2 W	OHMITE	RC20GF472J
R43	020198	RES	WW	250 K	.05%	1/8 W	JORDAN	J-11
R45	020198	RES	WW	250 K	.05%	1/8 W	JORDAN	J-11

PARTS LIST

ASSEMBLY 400843 **NULL DETECTOR ASSEMBLY**

REF. DESIG.	PART NO.	DESCRIPTION							
R46	000273	RES	CARBON	27 K	5%	1/4	W1	OHMITE	RC07GF273J
R47	000124	RES	CARBON	120 K	5%	1/4	W1	OHMITE	RC07GF124J
R49	020197	RES	WW	125 K	.05%	1/8	W	JORDAN	J-11
R50	020195	RES	WW	49.995 K	.01%	1/8	W	JORDAN	J-11
R51	020196	RES	WW	24.995 K	.01%	1/8	W	JORDAN	J-11
R52	020196	RES	WW	24.995 K	.01%	1/8	W	JORDAN	J-11
R53	020196	RES	WW	24.995 K	.01%	1/8	W	JORDAN	J-11
R54	020196	RES	WW	24.995 K	.01%	1/8	W	JORDAN	J-11
R55	020195	RES	WW	49.995 K	.01%	1/8	W	JORDAN	J-11

PARTS LIST

ASSEMBLY 400688 **SEQUENCE LOGIC ASSEMBLY**

REF. DESIG.	PART NO.	DESCRIPTION						
CR01	211083	DIODE SILICO	018			1	DANA	211083
CR02	211083	DIODE SILICO	018			1	DANA	211083
CR03	211083	DIODE SILICO	018			1	DANA	211083
CR04	211083	DIODE SILICO	018			1	DANA	211083
CR05	211083	DIODE SILICO	018			1	DANA	211083
CR06	211083	DIODE SILICO	018			1	DANA	211083
CR07	211083	DIODE SILICO	018			1	DANA	211083
CR25	211083	DIODE SILICO	018			1	DANA	211083
CR37	211083	DIODE SILICO	018			1	DANA	211083
C01	100012	CAP CERAM	33 PFD	500 V	10%		AEROVOX	TCD-N750
C10	101175	CAP CERAM	220 PFD	500 V	10%1		AEROVOX	SCD1X5F
Q01	200037	TRANS SILICO NPN	2N3646				FAIRCHILD	2N3646
Q02	200037	TRANS SILICO NPN	2N3646				FAIRCHILD	2N3646
R01	000222	RES CARBON	2.2 K	5%	1/4 W1		OHMITE	RC07GF222J
B-R01	000822	RES CARBON	8.2 K	5%	1/4 W1		OHMITE	RC07GF822J
R02	000153	RES CARBON	15 K	5%	1/4 W1		OHMITE	RC07GF153J
R03	000222	RES CARBON	2.2 K	5%	1/4 W1		OHMITE	RC07GF222J
B-R03	000822	RES CARBON	8.2 K	5%	1/4 W1		OHMITE	RC07GF822J
R04	000153	RES CARBON	15 K	5%	1/4 W1		OHMITE	RC07GF153J
R08	000123	RES CARBON	12 K	5%	1/4 W1		OHMITE	RC07GF123J
R10	000273	RES CARBON	27 K	5%	1/4 W1		OHMITE	RC07GF273J

PARTS LIST

ASSEMBLY 400689 **CONTROL LOGIC ASSEMBLY**

REF. DESIG.	PART NO.	DESCRIPTION				
CR01	211083	DIODE SILICO	018	1	DANA	211083
CR02	211083	DIODE SILICO	018	1	DANA	211083
CR03	211083	DIODE SILICO	018	1	DANA	211083
CR04	211083	DIODE SILICO	018	1	DANA	211083
CR05	211083	DIODE SILICO	018	1	DANA	211083
CR06	211083	DIODE SILICO	018	1	DANA	211083
CR07	211083	DIODE SILICO	018	1	DANA	211083
CR08	211083	DIODE SILICO	018	1	DANA	211083
CR09	211083	DIODE SILICO	018	1	DANA	211083
CR10	211083	DIODE SILICO	018	1	DANA	211083
CR11	211083	DIODE SILICO	018	1	DANA	211083
CR12	211083	DIODE SILICO	018	1	DANA	211083
CR13	211083	DIODE SILICO	018	1	DANA	211083
CR14	211083	DIODE SILICO	018	1	DANA	211083
CR15	211083	DIODE SILICO	018	1	DANA	211083
CR16	211083	DIODE SILICO	018	1	DANA	211083
CR17	211083	DIODE SILICO	018	1	DANA	211083
CR18	211083	DIODE SILICO	018	1	DANA	211083
CR19	211083	DIODE SILICO	018	1	DANA	211083
CR20	211083	DIODE SILICO	018	1	DANA	211083
CR21	211083	DIODE SILICO	018	1	DANA	211083
CR22	211083	DIODE SILICO	018	1	DANA	211083
CR23	211083	DIODE SILICO	018	1	DANA	211083
CR24	211083	DIODE SILICO	018	1	DANA	211083
CR25	211083	DIODE SILICO	018	1	DANA	211083
CR26	211083	DIODE SILICO	018	1	DANA	211083
CR27	211083	DIODE SILICO	018	1	DANA	211083
CR28	211083	DIODE SILICO	018	1	DANA	211083
CR29	211083	DIODE SILICO	018	1	DANA	211083
CR30	211083	DIODE SILICO	018	1	DANA	211083
CR31	211083	DIODE SILICO	018	1	DANA	211083
CR32	211083	DIODE SILICO	018	1	DANA	211083
CR33	211083	DIODE SILICO	018	1	DANA	211083
CR34	211083	DIODE SILICO	018	1	DANA	211083
CR35	211083	DIODE SILICO	018	1	DANA	211083
CR36	211083	DIODE SILICO	018	1	DANA	211083
C01	100012	CAP CERAM	33 PFD 500 V	10%	AEROVOX	TCD-N750
C02	121473	CAP MYLAR	.0015 MFD 100 V	10%1	CDE	WMF1S47

PARTS LIST

ASSEMBLY 400689 **CONTROL LOGIC ASSEMBLY**

REF. DESIG.	PART NO.	DESCRIPTION						
C03	121090	CAP	MYLAR	.015 MFD	100 V	10%1	CDE	WMF1S15
C04	101174	CAP	CERAM	.001 MFD	500 V	10%1	AEROVOX	SCD3X5F
C05	120001	CAP	MYLAR	.0033 MFD	100 V	10%1	CDE	WMF1D33
C06	110017	CAP	TANTA	1 MFD	35 V	10%1	KEMET	K1C35K
C07	110039	CAP	ELECT	5 MFD	50 V	20%	DUCATI	5-50
C08	110039	CAP	ELECT	5 MFD	50 V	20%	DUCATI	5-50
C09	110043	CAP	ELECT	25 MFD	25 V	20%	DUCATI	25-25
Q01	200037	TRANS	SILICO	NPN	2N3646		FAIRCHILD	2N3646
Q02	200037	TRANS	SILICO	NPN	2N3646		FAIRCHILD	2N3646
Q03	200037	TRANS	SILICO	NPN	2N3646		FAIRCHILD	2N3646
Q04	200037	TRANS	SILICO	NPN	2N3646		FAIRCHILD	2N3646
Q05	200011	TRANS	SILICO	PNP	009		DANA	200011
Q06	200037	TRANS	SILICO	NPN	2N3646		FAIRCHILD	2N3646
Q07	200037	TRANS	SILICO	NPN	2N3646		FAIRCHILD	2N3646
Q08	200037	TRANS	SILICO	NPN	2N3646		FAIRCHILD	2N3646
Q09	200037	TRANS	SILICO	NPN	2N3646		FAIRCHILD	2N3646
Q10	200035	TRANS	SILICO	NPN	014		DANA	200035
Q11	200035	TRANS	SILICO	NPN	014		DANA	200035
R01	000222	RES	CARBON	2.2 K	5%	1/4 W1	OHMITE	RC07GF222J
R02	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
R03	000222	RES	CARBON	2.2 K	5%	1/4 W1	OHMITE	RC07GF222J
R04	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
R05	000622	RES	CARBON	6.2 K	5%	1/4 W1	OHMITE	RC07GF622J
R06	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
R07	000242	RES	CARBON	2.4 K	5%	1/4 W1	OHMITE	RC07GF242J
R08	000822	RES	CARBON	8.2 K	5%	1/4 W1	OHMITE	RC07GF822J
R09	000204	RES	CARBON	200 K	5%	1/4 W	OHMITE	RC07GF204J
R10	000273	RES	CARBON	27 K	5%	1/4 W1	OHMITE	RC07GF273J
R11	000201	RES	CARBON	200 OHM	5%	1/4 W1	OHMITE	RC07GF201J
R12	000243	RES	CARBON	24 K	5%	1/4 W1	OHMITE	RC07GF243J
R13	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
R14	000822	RES	CARBON	8.2 K	5%	1/4 W1	OHMITE	RC07GF822J
R15	000104	RES	CARBON	100 K	5%	1/4 W1	OHMITE	RC07GF104J
R16	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
R17	000104	RES	CARBON	100 K	5%	1/4 W1	OHMITE	RC07GF104J
R18	001469	RES	CARBON	1.2 K	5%	1/2 W	OHMITE	RC20GF122J
R19	000203	RES	CARBON	20 K	5%	1/4 W1	OHMITE	RC07GF203J
R20	000203	RES	CARBON	20 K	5%	1/4 W1	OHMITE	RC07GF203J

PARTS LIST

ASSEMBLY 400689 **CONTROL LOGIC ASSEMBLY**

REF. DESIG.	PART NO.	DESCRIPTION						
R21	001469	RES	CARBON	1.2 K	5%	1/2 W	OHMITE	RC20GF122J
R22	000104	RES	CARBON	100 K	5%	1/4 W1	OHMITE	RC07GF104J
R23	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
R24	000104	RES	CARBON	100 K	5%	1/4 W1	OHMITE	RC07GF104J
R25	000222	RES	CARBON	2.2 K	5%	1/4 W1	OHMITE	RC07GF222J
R26	000223	RES	CARBON	22 K	5%	1/4 W	OHMITE	RC07GF223J
R27	040003	RES	VARI	20 K	10%	1/2 W	BOURNS	3067-P-1-20
R28	000222	RES	CARBON	2.2 K	5%	1/4 W1	OHMITE	RC07GF222J
R29	000104	RES	CARBON	100 K	5%	1/4 W1	OHMITE	RC07GF104J
R30	000273	RES	CARBON	27 K	5%	1/4 W1	OHMITE	RC07GF273J
R31	000103	RES	CARBON	10 K	5%	1/4 W1	OHMITE	RC07GF103J
R32	000103	RES	CARBON	10 K	5%	1/4 W1	OHMITE	RC07GF103J
R33	000103	RES	CARBON	10 K	5%	1/4 W1	OHMITE	RC07GF103J
R34	000103	RES	CARBON	10 K	5%	1/4 W1	OHMITE	RC07GF103J
R35	000822	RES	CARBON	8.2 K	5%	1/4 W1	OHMITE	RC07GF822J

PARTS LIST

ASSEMBLY 402502 **PCB ASSEMBLY-CONTROL LOGIC**

REF. DESIG.	PART NO.	DESCRIPTION				
CR01	211083	DIODE SILICO	018	1	DANA	211083
CR02	211083	DIODE SILICO	018	1	DANA	211083
CR03	211083	DIODE SILICO	018	1	DANA	211083
CR04	211083	DIODE SILICO	018	1	DANA	211083
CR05	211083	DIODE SILICO	018	1	DANA	211083
CR06	211083	DIODE SILICO	018	1	DANA	211083
CR07	211083	DIODE SILICO	018	1	DANA	211083
CR08	211083	DIODE SILICO	018	1	DANA	211083
CR09	211083	DIODE SILICO	018	1	DANA	211083
CR10	211083	DIODE SILICO	018	1	DANA	211083
CR11	211083	DIODE SILICO	018	1	DANA	211083
CR12	211083	DIODE SILICO	018	1	DANA	211083
CR13	211083	DIODE SILICO	018	1	DANA	211083
CR14	211083	DIODE SILICO	018	1	DANA	211083
CR15	211083	DIODE SILICO	018	1	DANA	211083
CR16	211083	DIODE SILICO	018	1	DANA	211083
CR17	211083	DIODE SILICO	018	1	DANA	211083
CR18	211083	DIODE SILICO	018	1	DANA	211083
CR19	211083	DIODE SILICO	018	1	DANA	211083
CR20	211083	DIODE SILICO	018	1	DANA	211083
CR21	211083	DIODE SILICO	018	1	DANA	211083
CR22	211083	DIODE SILICO	018	1	DANA	211083
CR23	211083	DIODE SILICO	018	1	DANA	211083
CR24	211083	DIODE SILICO	018	1	DANA	211083
CR25	211083	DIODE SILICO	018	1	DANA	211083
CR26	211083	DIODE SILICO	018	1	DANA	211083
CR27	211083	DIODE SILICO	018	1	DANA	211083
CR28	211083	DIODE SILICO	018	1	DANA	211083
CR29	211083	DIODE SILICO	018	1	DANA	211083
CR30	211083	DIODE SILICO	018	1	DANA	211083
CR31	211083	DIODE SILICO	018	1	DANA	211083
CR32	211083	DIODE SILICO	018	1	DANA	211083
CR33	211083	DIODE SILICO	018	1	DANA	211083
CR34	211083	DIODE SILICO	018	1	DANA	211083
CR35	211083	DIODE SILICO	018	1	DANA	211083
CR36	211083	DIODE SILICO	018	1	DANA	211083
CR37	211083	DIODE SILICO	018	1	DANA	211083
CR38	211083	DIODE SILICO	018	1	DANA	211083

PARTS LIST

ASSEMBLY 402502 **PCB ASSEMBLY-CONTROL LOGIC**

REF. DESIG.	PART NO.	DESCRIPTION						
C01	101145	CAP	CERAM	100 PFD	500 V	10%1	AEROVOX	SCD1X5F
C02	121473	CAP	MYLAR	.0015 MFD	100 V	10%1	CDE	WMF1S47
C03	121090	CAP	MYLAR	.015 MFD	100 V	10%1	CDE	WMF1S15
C04	101174	CAP	CERAM	.001 MFD	500 V	10%1	AEROVOX	SCD3X5F
C05	120001	CAP	MYLAR	.0033 MFD	100 V	10%1	CDE	WMF1D33
C06	110017	CAP	TANTA	1 MFD	35 V	10%1	KEMET	K1C35K
C07	110056	CAP	TANTA	4.7 MFD	35 V	10%	KEMET	K4R7C35K
C08	110056	CAP	TANTA	4.7 MFD	35 V	10%	KEMET	K4R7C35K
C09	110043	CAP	ELECT	25 MFD	25 V	20%	DUCATI	25-25
Q01	200037	TRANS	SILICO NPN	2N3646			FAIRCHILD	2N3646
Q02	200037	TRANS	SILICO NPN	2N3646			FAIRCHILD	2N3646
Q03	200037	TRANS	SILICO NPN	2N3646			FAIRCHILD	2N3646
Q04	200037	TRANS	SILICO NPN	2N3646			FAIRCHILD	2N3646
Q05	200011	TRANS	SILICO PNP	009			DANA	200011
Q06	200037	TRANS	SILICO NPN	2N3646			FAIRCHILD	2N3646
Q07	200037	TRANS	SILICO NPN	2N3646			FAIRCHILD	2N3646
Q08	200037	TRANS	SILICO NPN	2N3646			FAIRCHILD	2N3646
Q09	200037	TRANS	SILICO NPN	2N3646			FAIRCHILD	2N3646
Q10	200035	TRANS	SILICO NPN	014			DANA	200035
Q11	200035	TRANS	SILICO NPN	014			DANA	200035
R01	000222	RES	CARBON	2.2 K	5%	1/4 W1	OHMITE	RC07GF222J
R02	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
R03	000222	RES	CARBON	2.2 K	5%	1/4 W1	OHMITE	RC07GF222J
R04	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
R05	000622	RES	CARBON	6.2 K	5%	1/4 W1	OHMITE	RC07GF622J
R06	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
R07	000242	RES	CARBON	2.4 K	5%	1/4 W1	OHMITE	RC07GF242J
R08	000123	RES	CARBON	12 K	5%	1/4 W1	OHMITE	RC07GF123J
R-R08	000432	RES	CARBON	4.3 K	5%	1/4 W1	OHMITE	RC07GF432J
R09	000204	RES	CARBON	200 K	5%	1/4 W	OHMITE	RC07GF204J
R10	000273	RES	CARBON	27 K	5%	1/4 W1	OHMITE	RC07GF273J
R11	000201	RES	CARBON	200 OHM	5%	1/4 W1	OHMITE	RC07GF201J
R13	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
R14	000822	RES	CARBON	8.2 K	5%	1/4 W1	OHMITE	RC07GF822J
R15	000104	RES	CARBON	100 K	5%	1/4 W1	OHMITE	RC07GF104J
R16	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
R17	000104	RES	CARBON	100 K	5%	1/4 W1	OHMITE	RC07GF104J
R18	001469	RES	CARBON	1.2 K	5%	1/2 W	OHMITE	RC20GF122J

PARTS LIST

ASSEMBLY 402502 **PCB ASSEMBLY-CONTROL LOGIC**

REF. DESIG.	PART NO.	DESCRIPTION						
R19	000203	RES	CARBON	20 K	5%	1/4 W1	OHMITE	RC07GF203J
R20	000203	RES	CARBON	20 K	5%	1/4 W1	OHMITE	RC07GF203J
R21	001469	RES	CARBON	1.2 K	5%	1/2 W	OHMITE	RC20GF122J
R22	000104	RES	CARBON	100 K	5%	1/4 W1	OHMITE	RC07GF104J
R23	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
R24	000104	RES	CARBON	100 K	5%	1/4 W1	OHMITE	RC07GF104J
R25	000222	RES	CARBON	2.2 K	5%	1/4 W1	OHMITE	RC07GF222J
R26	000183	RES	CARBON	18K	5%	1/4 W1	OHMITE	RC07GF183J
R27	040054	RES	VARI	50K	10%	1/5 W	BOURNS	3068-P-1530
R28	000222	RES	CARBON	2.2 K	5%	1/4 W1	OHMITE	RC07GF222J
R29	000104	RES	CARBON	100 K	5%	1/4 W1	OHMITE	RC07GF104J
R30	000393	RES	CARBON	39 K	5%	1/4 W	OHMITE	RC07GF393J
R31	000103	RES	CARBON	10 K	5%	1/4 W1	OHMITE	RC07GF103J
R32	000103	RES	CARBON	10 K	5%	1/4 W1	OHMITE	RC07GF103J
R33	000103	RES	CARBON	10 K	5%	1/4 W1	OHMITE	RC07GF103J
R34	000103	RES	CARBON	10 K	5%	1/4 W1	OHMITE	RC07GF103J
R35	000822	RES	CARBON	8.2 K	5%	1/4 W1	OHMITE	RC07GF822J
A-C01	101145	CAP	CERAM	100 PFD 500V 10%1			AEROVOX	SCD1X5F
B-C01	101145	CAP	CERAM	100 PFD 500V 10%1			AEROVOX	SCD1X5F

PARTS LIST

ASSEMBLY 400840 **REFERENCE & BUFFER AMPLIFIER ASSEMBLY**

REF. DESIG.	PART NO.	DESCRIPTION						
CR01	220007	DIODE SILICO ZENER 1N751				1	MOTOROLA	1N751
CR02	211236	DIODE SILICO 007					DANA	211236
CR04	211083	DIODE SILICO 018				1	DANA	211083
CR05	211083	DIODE SILICO 018				1	DANA	211083
CR06	211236	DIODE SILICO 007					DANA	211236
CR07	211236	DIODE SILICO 007					DANA	211236
CR08	220012	DIODE SILICO ZENER 1N958B				1	MOTOROLA	1N958B
CR09	220012	DIODE SILICO ZENER 1N958B				1	MOTOROLA	1N958B
CR10	211083	DIODE SILICO 018				1	DANA	211083
CR11	211083	DIODE SILICO 018				1	DANA	211083
CR12	211083	DIODE SILICO 018				1	DANA	211083
C01	101098	CAP CERAM	330 PFD	500 V	10%1		AEROVOX	SCD1X5F
C02	101642	CAP CERAM	150 PFD	500 V	10%1		AEROVOX	SCD2X5F
C04	121393	CAP MYLAR	.22 MFD	100 V	10%		CDE	WMF1P22
C05	110036	CAP ELECT	25 MFD	50 V	20%		DUCATI	25-50
C06	110036	CAP ELECT	25 MFD	50 V	20%		DUCATI	25-50
C07	110036	CAP ELECT	25 MFD	50 V	20%		DUCATI	25-50
C08	120005	CAP MYLAR	.001 MFD	100 V	10%1			WMF1D1
C09	120005	CAP MYLAR	.001 MFD	100 V	10%1			WMF1D1
C10	101145	CAP CERAM	100 PFD	500 V	10%1		AEROVOX	SCD1X5F
C12	121092	CAP MYLAR	.0022 MFD	100 V	10%		CDE	WMF1D22
Q01	200040	TRANS SILICO NPN 016					DANA	200040
Q02	200043	TRANS SILICO NPN 2N3565					FAIRCHILD	2N3565
Q03	200043	TRANS SILICO NPN 2N3565					FAIRCHILD	2N3565
Q04	200011	TRANS SILICO PNP 009					DANA	200011
Q05	200035	TRANS SILICO NPN 014					DANA	200035
Q06	200043	TRANS SILICO NPN 2N3565					FAIRCHILD	2N3565
Q07	200043	TRANS SILICO NPN 2N3565					FAIRCHILD	2N3565
Q08	200043	TRANS SILICO NPN 2N3565					FAIRCHILD	2N3565
Q09	200043	TRANS SILICO NPN 2N3565					FAIRCHILD	2N3565
Q10	200011	TRANS SILICO PNP 009					DANA	200011
Q11	200035	TRANS SILICO NPN 014					DANA	200035
Q12	200035	TRANS SILICO NPN 014					DANA	200035
Q13	200011	TRANS SILICO PNP 009					DANA	200011
R01	000512	RES CARBON	5.1 K		5% 1/4 W1		OHMITE	RC07GF512J
R02	400840	BRIDGE ELEMENT SHORT TERM STABILITY					DANA	400840
R03	000270	RES CARBON	27 OHM		5% 1/4 W		OHMITE	RC07GF270J
R04	400840	BRIDGE ELEMENT SHORT TERM STABILITY					DANA	400840

PARTS LIST

ASSEMBLY 400840 **REFERENCE & BUFFER AMPLIFIER ASSEMBLY**

REF. DESIG.	PART NO.	DESCRIPTION							
R05	040050	RES	VARI	5 K	10%	1/2 W		BOURNS	3067-P-1-K0
R06	400840	BRIDGE ELEMENT		SHORT TERM STABILITY				DANA	400840
R07	000681	RES	CARBON	680 OHM	5%	1/4 W1		OHMITE	RC07GF681J
R08	010158	RES	METAL	200 K	1%	1/4 W1		ELECTRA	RN60D2003F
R09	040054	RES	VARI	50 K	10%	1/5 W		BOURNS	3068-P-1503
R10	010208	RES	METAL	182 K	1%	1/4 W1		ELECTRA	RN60D1823F
R11	010158	RES	METAL	200 K	1%	1/4 W1		ELECTRA	RN60D2003F
R12	000122	RES	CARBON	1.2 K	5%	1/4 W1		OHMITE	RC07GF122J
R13	000101	RES	CARBON	100 OHM	5%	1/4 W1		OHMITE	RC07GF101J
R14	000273	RES	CARBON	27 K	5%	1/4 W1		OHMITE	RC07GF273J
R15	000242	RES	CARBON	2.4 K	5%	1/4 W1		OHMITE	RC07GF242J
R16	000101	RES	CARBON	100 OHM	5%	1/4 W1		OHMITE	RC07GF101J
R17	000105	RES	CARBON	1 M	5%	1/4 W1		OHMITE	RC07GF105J
R18	000622	RES	CARBON	6.2 K	5%	1/4 W1		OHMITE	RC07GF622J
R19	000363	RES	CARBON	36 K	5%	1/4 W1		OHMITE	RC07GF363J
R20	000622	RES	CARBON	6.2 K	5%	1/4 W1		OHMITE	RC07GF622J
R21	000105	RES	CARBON	1 M	5%	1/4 W1		OHMITE	RC07GF105J
R22	000242	RES	CARBON	2.4 K	5%	1/4 W1		OHMITE	RC07GF242J
R23	000102	RES	CARBON	1 K	5%	1/4 W1		OHMITE	RC07GF102J
R24	000473	RES	CARBON	47 K	5%	1/4 W1		OHMITE	RC07GF473J
R25	000102	RES	CARBON	1 K	5%	1/4 W1		OHMITE	RC07GF102J
R26	000471	RES	CARBON	470 OHM	5%	1/4 W1		OHMITE	RC07GF471J
R27	000682	RES	CARBON	6.8 K	5%	1/4 W1		OHMITE	RC07GF682J
R28	000240	RES	CARBON	24 OHM	5%	1/4 W1		OHMITE	RC07GF240J
R29	000510	RES	CARBON	51 OHM	5%	1/4 W1		OHMITE	RC07GF510J
R30	001702	RES	CARBON	1.6 K	5%	1/2 W		OHMITE	RC20GF162J
R32	000102	RES	CARBON	1 K	5%	1/4 W1		OHMITE	RC07GF102J
R33	000681	RES	CARBON	680 OHM	5%	1/4 W1		OHMITE	RC07GF681J
R34	000100	RES	CARBON	10 OHM	5%	1/4 W1		OHMITE	RC07GF100J

PARTS LIST

ASSEMBLY 400684 **REAR PANEL ASSY. 5400**

REF. DESIG.	PART NO.	DESCRIPTION							
C02	110034	CAP	ELECT	1000	MFD	35	V	DUAL	MALLORY	MP-201.5A
C03	110034	CAP	ELECT	1000	MFD	35	V	DUAL	MALLORY	MP-201.5A
C04	110034	CAP	ELECT	1000	MFD	35	V	DUAL	MALLORY	MP-201.5A
C05	110034	CAP	ELECT	1000	MFD	35	V	DUAL	MALLORY	MP-201.5A
C06	110034	CAP	ELECT	1000	MFD	35	V	DUAL	MALLORY	MP-201.5A
C07	110034	CAP	ELECT	1000	MFD	35	V	DUAL	MALLORY	MP-201.5A
C08	110034	CAP	ELECT	1000	MFD	35	V	DUAL	MALLORY	MP-201.5A
C10	110034	CAP	ELECT	1000	MFD	35	V	DUAL	MALLORY	MP-201.5A
C12	110035	CAP	ELECT	50	MFD	350	V	20%	MALLORY	FP-137A

PARTS LIST

ASSEMBLY 400707 **POWER SUPPLY ASSEMBLY**

REF. DESIG.	PART NO.	DESCRIPTION
CR01	210004	DIODE SILICO SD4 DIODES IN SD4
CR02	210004	DIODE SILICO SD4 DIODES IN SD4
CR03	210004	DIODE SILICO SD4 DIODES IN SD4
CR04	210004	DIODE SILICO SD4 DIODES IN SD4
CR05	210004	DIODE SILICO SD4 DIODES IN SD4
CR06	210004	DIODE SILICO SD4 DIODES IN SD4
CR07	210004	DIODE SILICO SD4 DIODES IN SD4
CR08	210004	DIODE SILICO SD4 DIODES IN SD4
CR09	210004	DIODE SILICO SD4 DIODES IN SD4
CR10	210004	DIODE SILICO SD4 DIODES IN SD4
CR11	210004	DIODE SILICO SD4 DIODES IN SD4
CR12	210004	DIODE SILICO SD4 DIODES IN SD4
CR13	210004	DIODE SILICO SD4 DIODES IN SD4
CR14	220015	DIODE SILICO ZENER 1N967B MOTOROLA 1N967B
CR15	220015	DIODE SILICO ZENER 1N967B MOTOROLA 1N967B
C01	121088	CAP MYLAR .01 MFD 100 V 10% CDE WMF1S1
C08	121088	CAP MYLAR .01 MFD 100 V 10% CDE WMF1S1
C11	120072	CAP MYLAR .01 MFD 600 V 10% CDE WMF651
C13	110041	CAP ELECT 250 MFD 6 V 20% DUCATI 250-6
C15	110036	CAP ELECT 25 MFD 50 V 20% DUCATI 25-50
C16	110036	CAP ELECT 25 MFD 50 V 20% DUCATI 25-50
C18	101174	CAP CERAM .001 MFD 500 V 10%1 AEROVOX SCD3X5F
C19	101174	CAP CERAM .001 MFD 500 V 10%1 AEROVOX SCD3X5F
Q01	200035	TRANS SILICO NPN 014 DANA 200035
Q02	200011	TRANS SILICO PNP 009 DANA 200011
R01	030008	RES CARBON 200 OHM 5% 3 W OHMITE 4399
R02	031450	RES CARBON 220 K 5% 2 W OHMITE RC42GF224J
R03	000202	RES CARBON 2 K 5% 1/4 W1 OHMITE RC07GF202J
R04	030007	RES CARBON 150 OHM 5% 3 W OHMITE 4396
R05	000151	RES CARBON 150 OHM 5% 1/4 W1 OHMITE RC07GF151J
R06	000202	RES CARBON 2 K 5% 1/4 W1 OHMITE RC07GF202J
R07	000151	RES CARBON 150 OHM 5% 1/4 W1 OHMITE RC07GF151J
R08	030007	RES CARBON 150 OHM 5% 3 W OHMITE 4396

PARTS LIST

ASSEMBLY 402000 **ASSY. POWER SUPPLY**

REF. DESIG.	PART NO.	DESCRIPTION							
C08	110034	CAP	ELECT	1000	MFD	35	V	DUAL	MALLORY	WP-201.5A
C09	110034	CAP	ELECT	1000	MFD	35	V	DUAL	MALLORY	WP-201.5A
C11	110034	CAP	ELECT	1000	MFD	35	V	DUAL	MALLORY	WP-201.5A
C13	110034	CAP	ELECT	1000	MFD	35	V	DUAL	MALLORY	WP-201.5A
C15	110034	CAP	ELECT	1000	MFD	35	V	DUAL	MALLORY	WP-201.5A
C19	110034	CAP	ELECT	1000	MFD	35	V	DUAL	MALLORY	WP-201.5A
T01	300017	TRANSFORMER POWER							AZTEC	10311

PARTS LIST

ASSEMBLY 402316 **POWER SUPPLY ASSEMBLY**

REF. DESIG.	PART NO.	DESCRIPTION
CR01	210004	DIODE SILICO SD4 DIODES IN SD4
CR02	210004	DIODE SILICO " DIODES IN SD4
CR03	210014	DIODE SILICO 023 1 Dana 210014
CR04	210014	DIODE SILICO 023 1 Dana 210014
CR07	210004	DIODE SILICO SD4 DIODES IN SD4
CR08	210004	DIODE SILICO SD4 DIODES IN SD4
CR09	210004	DIODE SILICO SD4 DIODES IN SD4
CR10	210004	DIODE SILICO SD4 DIODES IN SD4
CR11	210004	DIODE SILICO SD4 DIODES IN SD4
CR12	210004	DIODE SILICO SD4 DIODES IN SD4
CR13	210014	DIODE SILICO 023 1 Dana 210014
CR14	210014	DIODE SILICO 023 1 Dana 210014
CR15	210004	DIODE SILICO SD4 DIODES IN SD4
CR16	210004	DIODE SILICO SD4 DIODES IN SD4
CR17	210004	DIODE SILICO SD4 DIODES IN SD4
CR18	220015	DIODE SILICO ZENER 1N967B MOTOROLA 1N967B
CR19	220015	DIODE SILICO ZENER 1N967B MOTOROLA 1N967B
C02	121088	CAP MYLAR .01 MFD 100 V 10% CDE WMF1S1
C03	121088	CAP MYLAR .01 MFD 100 V 10% CDE WMF1S1
C04	121088	CAP MYLAR .01 MFD 100 V 10% CDE WMF1S1
C05	120072	CAP MYLAR .01 MFD 600 V 10% CDE WMF651
C22	110041	CAP ELECT 250 MFD 6 V 20% DUCATI 250-6
C23	110036	CAP ELECT 25 MFD 50 V 20% DUCATI 25-50
C24	110036	CAP ELECT 25 MFD 50 V 20% DUCATI 25-50
C25	101174	CAP CERAM .001 MFD 500 V 10%1 AEROVOX SCD3X5F
C26	101174	CAP CERAM .001 MFD 500 V 10%1 AEROVOX SCD3X5F
Q01	200035	TRANS SILICO NPN 014 DANA 200035
Q02	200011	TRANS SILICO PNP 009 DANA 200011
R01	031450	RES CARBON 220 K 5% 2 W OHMITE RC42GF224J
R02	030008	RES CARBON 200 OHM 5% 3 W OHMITE 4399
R03	000202	RES CARBON 2 K 5% 1/4 W1 OHMITE RC07GF202J
R04	000202	RES CARBON 2 K 5% 1/4 W1 OHMITE RC07GF202J
R05	000151	RES CARBON 150 OHM 5% 1/4 W1 OHMITE RC07GF151J
R06	000151	RES CARBON 150 OHM 5% 1/4 W1 OHMITE RC07GF151J
R07	030007	RES CARBON 150 OHM 5% 3 W OHMITE 4396
R08	030007	RES CARBON 150 OHM 5% 3 W OHMITE 4396

PARTS LIST

ASSEMBLY 402019 **CAPACITOR ASSY.**

REF. DESIG.	PART NO.	DESCRIPTION							
C07	110035	CAP	ELECT	50	MFD	350	V	20%	MALLORY FP-137A
C10	110034	CAP	ELECT	1000	MFD	35	V	DUAL	MALLORY WP-201.5A
C12	110034	CAP	ELECT	1000	MFD	35	V	DUAL	MALLORY WP-201.5A
C14	110034	CAP	ELECT	1000	MFD	35	V	DUAL	MALLORY WP-201.5A
C16	110034	CAP	ELECT	1000	MFD	35	V	DUAL	MALLORY WP-201.5A
C17	110034	CAP	ELECT	1000	MFD	35	V	DUAL	MALLORY WP-201.5A
C18	110034	CAP	ELECT	1000	MFD	35	V	DUAL	MALLORY WP-201.5A
C20	110034	CAP	ELECT	1000	MFD	35	V	DUAL	MALLORY WP-201.5A
C21	110034	CAP	ELECT	1000	MFD	35	V	DUAL	MALLORY WP-201.5A

Warranty

It is the practice of Dana Laboratories, Incorporated, to manufacture only products of a quality that will merit customer satisfaction. The company recognizes that customer satisfaction is achieved, not only by delivering products meeting advertised performance specifications and having a high level of reliability, but also by honestly and efficiently fulfilling their warranty obligations as set forth below.

Dana Laboratories, Inc., agrees to correct, either by repair or replacement, any defect of material or workmanship in Dana-manufactured units or components which develop within one year after delivery of the equipment to the original purchaser — provided that the equipment has been subjected only to normal and proper use.

In the event of failure of any component delivered with Dana equipment, but not manufactured by Dana Laboratories, assistance will be given the customer in obtaining, from the original manufacturer, reasonable adjustment under that manufacturer's warranty.

Any item claimed to be defective during the warranty period must be returned to Dana Laboratories, Inc., with transportation charges prepaid. The item will be repaired and returned to the purchaser with return transportation prepaid by Dana unless, of course, the item is found not to be defective or found to be damaged by misuse — in which case it will be returned to the purchaser with repair and transportation billed collect.

DANA

Guarantee

It is the practice of Dana Laboratories, Incorporated, to manufacture only products of a quality that will stand comparison with the highest standards in the industry. Each instrument is inspected and tested before shipment, but if you should experience any difficulty in operation, please return the instrument to the factory or to the dealer from whom you purchased it. Dana Laboratories will repair or replace, at its option, any defective parts or workmanship for a period of one year after delivery to the original purchaser. This guarantee does not apply to damage resulting from misuse, accident, or unauthorized repairs or alterations.

Dana Laboratories also warrants to correct either by repair or replacement, any defect of material or workmanship in Dana-manufactured units or components which occurs within one year after delivery of the instrument to the original purchaser — provided that the instrument has been employed only in normal and proper use.

In the event of failure of any component delivered with Dana equipment, but not manufactured by Dana Laboratories, replacement will be given the customer in obtaining from the original manufacturer, the same adjustment under that manufacturer's warranty.

Any item claimed to be defective during the warranty period must be returned to Dana Laboratories, Incorporated, with transportation charges prepaid. The item will be repaired and returned to the purchaser with return transportation prepaid by Dana unless, by our test, it is found not to be defective or to have been damaged by misuse — in which case it will be returned to the purchaser with appropriate billing.

DANA

DANA™

www.manualsplus.com
1012946